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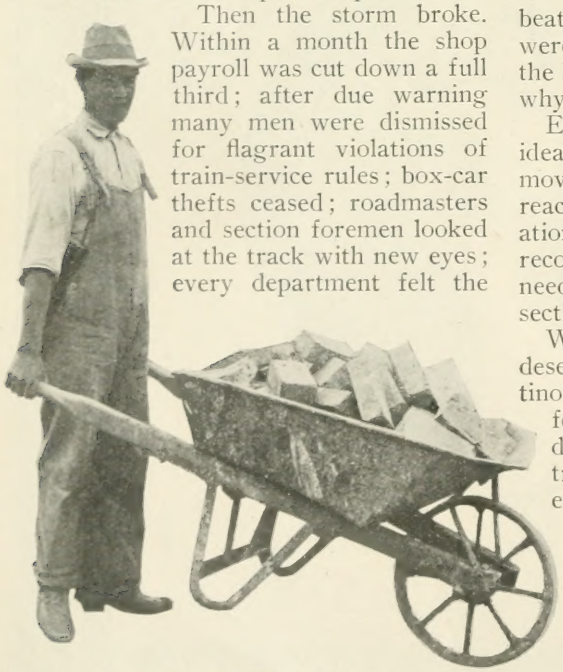
THE MAN IN

BY WALTER V. WOEHLKE

ON his new division the superintendent found abundant opportunities for decisive action. It was the big system's sore spot. "Boomer" railroad men infested it; outlaw crews, discharged elsewhere, gravitated to it. Since the day of its building this desert stretch of the line had been ruled by the bulldozer and the bad man who bluffed the officials and dominated the quiet worker.

On the first day the superintendent found, besides many pumping joints and broken ties, a rail with not a single spike to hold it down between joints. On the second day a switch engine tied up in front of his window, the crew marched across the yard and, defiantly violating the iron-clad rule prohibiting drinking on duty, returned with large cans of foaming cheer. On the third day the new boss found two men drawing pay for three men's work in the repair shops.

Then the storm broke. Within a month the shop payroll was cut down a full third; after due warning many men were dismissed for flagrant violations of train-service rules; box-car thefts ceased; roadmasters and section foremen looked at the track with new eyes; every department felt the worn boards heave under its dragging feet.



"A MAN'S A MAN FOR A' THAT."
Applied to their everyday relations with employes, hard-headed business men find that this poetic sentiment pays.

Twice the superintendent of the outlaw desert division was attacked by men armed with knives and guns. His house was torn to pieces by a bomb while he slept. His past was pried into for a weak spot. Incendiaries burned down the shops. He recommended that they be not rebuilt. For a year and a half bodyguards watched over him day and night. Thus did the desert division fight efficiency.

But the superintendent won. He whipped that stretch of road into shape.

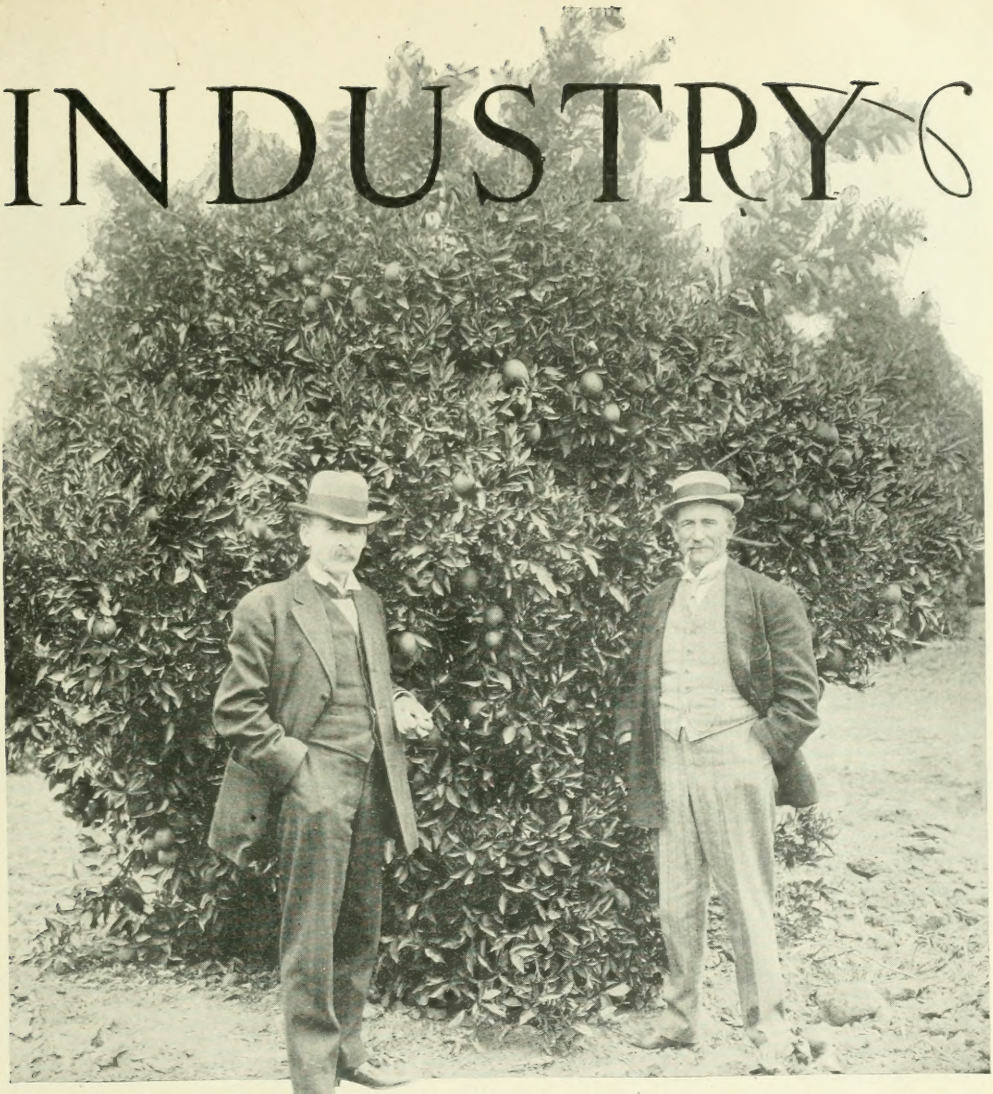
When he left, all the employes presented him with a handsome token of their esteem. Their spokesman, looking the boss straight in the eye, said:

"We fought you hard. You have beaten us, and we realize now that you were right. You always fought fair, on the level. You were always just. That's why we offer you this remembrance."

Efficiency is this superintendent's one ideal, the safe, uninterrupted, economical movement of trains his one goal. He reached the goal, obtained the co-operation of all those around him because he recognized the man, his rights and his needs, even in the lowest dark-skinned section hand!

While the new superintendent of the desert division was whipping the mutinous upper crust of his army into shape for effective work—without rigorous discipline in the ranks no army, industrial or otherwise, can win—he was equally busy raising the efficiency of the pariah among railroad workers, the section "hand." Usually the section gangs consist of foreigners, ignorant of the country's language and customs, the easiest victims of the vultures preying on defenseless poverty. In the Southwest section hands are imported from

INDUSTRY



TWO ORANGE GROVE FOREMEN AT RIVERSIDE, CALIFORNIA, WHO STARTED AS DAY LABORERS.
They also own groves, but are still rendering loyal service to the company that gave them their start.

Mexico by the carload, paid a dollar a day to start with and turned over to supply firms anxious to get the largest part of that dollar. To these peons went the superintendent with an interpreter, inspecting their quarters, their food, their accounts with the commissary, encouraging them to tell their grievances, promising fair, just treatment.

The peons spoke, slowly, haltingly at first, but without reserve when they found that the big man was sincere. The superintendent listened. He said little, but his heel came down at once, crushing the petty graft of which the Mexicans had been the victims. He protected their wives and daughters. On the desert he gradually replaced the ancient shacks built of old ties with modern hollow-tile houses, cool, comfortable, sanitary and attractive. Around every house he planted trees, drilled wells and supplied pure water in abundance. Every month he went over every foot of his division, stopping at all section houses and work-cars where the brown, solemn-eyed children were waiting for him, certain to receive an apple, a banana or an orange.

Nor did the superintendent forget the

PART OF THIRTY-FIVE HUNDRED ACRES IN ORANGES AND
This big ranch showed a loss every year until a new manager realizing that financial success without as a man. Since then the

white workers, the section foremen and their families. For them, likewise, he built better houses, planted trees, furnished them ice, sent their wives and children to a tent colony by the surf during the withering heat of the desert summer. He changed them about, sent single men to the isolated posts and transferred those with children to the settlements, building schools where transfers could not be made. He endeavored to make them comfortable and contented, that the trains might move swiftly and safely over the tracks in their charge.

Did it pay?

A cloudburst sent a roaring flood against the tracks early this summer. It seemed as though the gap would tie up traffic on the main line for thirty-six hours, and every hour's delay meant the loss of thousands of dollars. The section men, white and brown, willing, eager, anxious to show their mettle, threw themselves into the breach, worked like demons before the water had receded. In less than ten hours the gap was bridged, trains were moving again.

One of the largest contracting firms in the country was badly beaten in a battle with natural forces, had to throw up the job and stand a loss of a quarter of a million because the engineer in charge paid too much attention to plans and not enough to men and their needs. The contract involved the construction of a large dam in a desert, across an erratic river given to unexpected floods, and the difficulties were increased by repeated failures to find firm anchorage for the core. A highly skilled technical expert was sent out to supervise the work. Deeply engrossed in his plans, this expert allowed the commissary department to fall into the hands of a cunning, shrewd, grasping trader. As a result a continuous stream of workmen was coming and going. The

HOMES OF THE YELLOW WORKERS ON THE BIG ORANGE RANCH AT RIVERSIDE.
Even a steam bath house and a Japanese garden were added to keep up the men's spirits, and, hence, their efficiency.

LEMONS IN CALIFORNIA OWNED BY ENGLISH CAPITALISTS.
the co-operation of the ranch hands was impossible, treated every worker—white, brown, or yellow—ranch has paid big dividends.

men worked a few days, cussed the meals, cussed the quarters, cussed everything connected with the job and quit. Within a short time the company withdrew from the contract, glad to escape with a loss of $250,000 caused largely by the camp kitchen.

Yellow-fever mosquitoes cannot inoculate machines. How many additional years and millions would be required to complete the Panama Canal if the health and vigor of the men had not been the engineers' first consideration? France can supply the answer.

The United States has the largest deposits of high-grade iron ore in the world. It is mined cheaply, shipped to the furnaces by water at small expense. Coal is abundant and cheap. The equipment of the plants is technically perfect. The industry is thoroughly organized for conquest. The American steel industry should be the most formidable factor in the world market. It isn't. In international trade it is a negligible quantity. Despite high protection it cannot supply rails upon which the country's traffic may move safely. Were it not for the tariff wall, Europe would beat the Steel Trust in its home market. Even now Europe is underbidding it on the Pacific coast. One-third of the Trust's immense capacity lies perpetually idle, unproductive. This gigantic industry degrades its workers, brutalizes them by excessive hours seven days in the week, breaks down body and spirit by driving them at the fastest speed for the smallest possible pay. Is there any relation between the Trust's notorious inefficiency and failure, the most favorable conditions notwithstanding, and the treatment it accords its workers?

Perhaps it is a coincidence that the one great American industry which consistently looked after the welfare of its employes has conquered a leading place in the markets of the world for its manufactured product. Whatsoever other crimes the Standard Oil Company has committed, it never was guilty of the stupid policy that takes the spring, the efficiency, the spirit out of the producer by underpaying and overworking him. No unions, strikes, pickets and bombs were needed to obtain decent conditions, reasonable hours and fair wages in the Standard Oil plants.

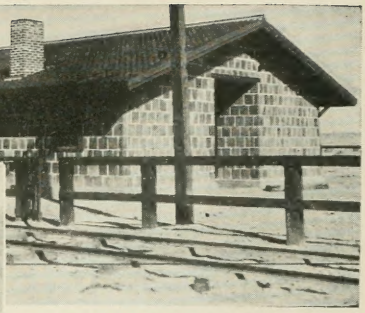
Gradually it is dawning upon the captains of industry that low wages and long hours do not necessarily make for low manufacturing cost. They are finding out that the cost often rises with the cheapening of blood and bone, that cost goes up as the spirit of the worker is crushed down.

Feathers and plumes are prepared in New York sweatshops for the hats fair ladies wear. Low pay, long hours, dark, badly ventilated shops, cheerless homes are the workers' lot. Little children perform many of the operations.

A California concern competes with the sweatshops. Its employes work eight hours a day; the law allows no overtime for women. Children are barred. The factory, flooded with light and air, stands in the center of an attractive park. Roses climb to the roofs of the workers' cottages; sunshine bathes them and the

eternal mountains look down upon them. The pay of the California women averages fifty per cent. higher than the earning ca-

THE SORT OF VILE LIVING QUARTERS THE NEW RAILROAD SUPERINTENDENT FOUND AND GOT RID OF.



TILE BUILT DWELLINGS KEEP THE SECTION HANDS COOL.
Besides the quarters are clean.

pacity of the sweatshop "hands." Freight rates to New York are steep. Nevertheless the California concern habitually underbids the sweatshops right in New York and captures the business. Cheap labor is inefficient labor; inefficiency raises cost.

Some twenty years ago English capitalists invested several millions in Cali-

FEW RICH MEN HAVE QUARTERS SUPERIOR, IN ATTRACTIVENESS, TO THESE HOMES OF HUMBLE WORKMEN ON THIS CALIFORNIA FRUIT RANCH.

fornia citrus plantations covering some thirty-five hundred acres. Hard-riding, sport-loving English managers were sent out to look after the property. It never paid. Producing-costs always exceeded the amounts received for the fruit. To the managers the four hundred employes were ranch "hands."

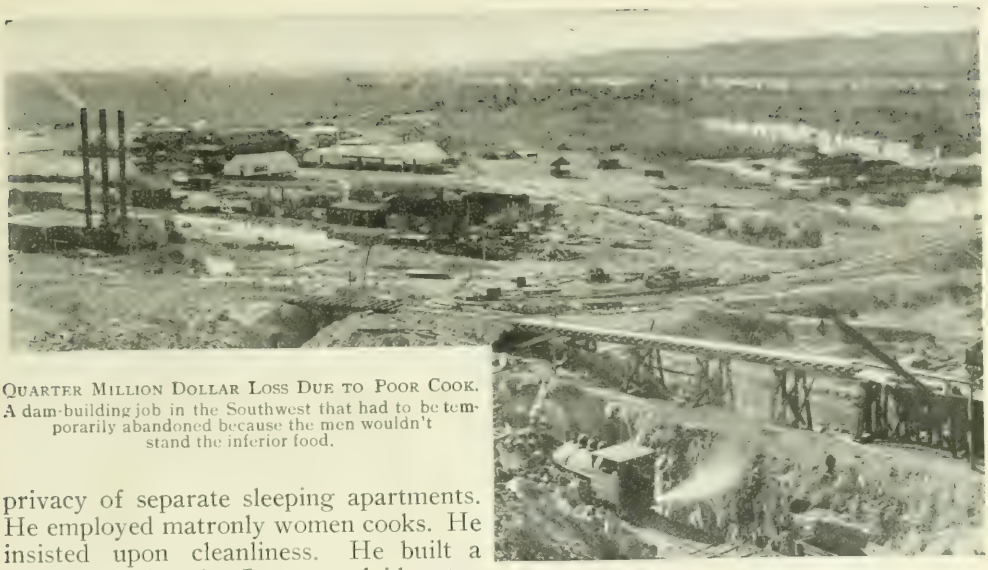
A new field manager took charge of operations nine years ago. He had risen from the ranks. He knew men, their needs and their weaknesses. One of his first orders was to burn all the bedding, most of the cots and to flood the quarters with strong disinfectants. The directors howled.

"Could you do a day's work if you spent the night fighting vermin instead of sleeping?" the new manager asked them. They saw the point.

Gradually the manager rebuilt the men's quarters. He supplied shower baths, reading rooms, rose hedges, the

THE QUARTERS OF THE WHITE WORKERS ON THE THIRTY-FIVE HUNDRED ACRE RANCH.

The new manager ordered all the old cots and bedding burned. "Men who have to fight vermin all night can't work during the day," he answered when the directors howled. They saw the point.



QUARTER MILLION DOLLAR LOSS DUE TO POOR COOK. A dam-building job in the Southwest that had to be temporarily abandoned because the men wouldn't stand the inferior food.

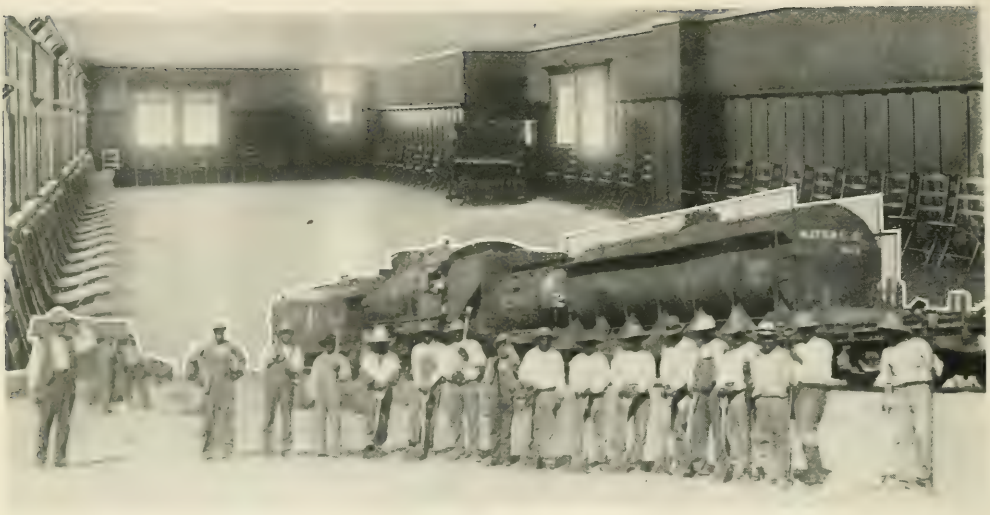
privacy of separate sleeping apartments. He employed matronly women cooks. He insisted upon cleanliness. He built a steam-bath for the Japanese, laid out a Japanese garden for them. He installed tennis courts for the white workers, increased their wages according to proficiency, chose all his foremen and assistant superintendents from their ranks, encouraged them to save, to buy land, helped them with his credit to become independent.

The English shareholders have been drawing large dividends ever since the new managers started to operate the ranch with men instead of "hands."

On the north side in Chicago there is a plant manufacturing pump fittings. It is owned by a young man who started at the lathe fifteen years ago, earning $2.50 a week. When he became an employer he did not forget the lessons of his wage-earning period.

This man deliberately cultivates pleas-

ANOTHER VIEW, GIVING SOME NOTION OF THE MAGNITUDE OF THE ENGINEERING JOB THAT HAD TO BE ABANDONED BECAUSE THE WORKERS WERE DISSATISFIED.



MALCONTENTS WHO BECAME FAITHFUL EMPLOYES, BECAUSE THEIR COMPLAINTS WERE HONESTLY INVESTIGATED AND THE CAUSE OF THEM AS HONESTLY REMOVED.

ant, personal relations with his men. He makes it a practice to have a nod and a word with every one of them each morning. He encourages them to tell him their troubles; he knows their families, their joys and sorrows, notices their new suits and hats. Every Christmas presents are exchanged between the men and the boss. Hot water, plenty of soap and towels are always to be found in the lavatories. In the summer the owner supplies electric fans, ice and distilled water at his own expense. He pays the highest wages in his line and demands the highest skill. His employes do not rush out of the shop. They are in no hurry to get away. It takes them ten or fifteen minutes to wash up thoroughly, to make a complete change and put on white collars before they go home. They respect themselves, respect the boss and like their work.

"Afraid of a trust? Not a bit!" The owner laughed. "The bigger the trust, the easier it is to beat it, if it fights fairly. Trust production as a rule is unwieldy, inefficient. I pay as much, even more than my biggest competitors, but my manufacturing cost is lower than theirs. That's because I keep in personal touch with my men and their work all the time. The trust and the great big manufacturer can't do that. I can go into my shop any day with a rush order and ask Jim and Fred to stretch themselves a bit getting the work out, giving them the reason for the hurry. They always do hurry, because they like me and like their jobs. It's the *spirit* of the men that makes for efficiency and low manufacturing cost."

No amount of scientific management can produce the *esprit de corps* that wins industrial victories. Quite as important as the brick-layer's number of motions is his spirit, his mental attitude toward his work. Can the worker, will the worker put the vim and energy into toil the reward of which is barely sufficient to keep a stunted soul in a hungry body?

With human scrubs, nags and plugs scientific management will be of little avail. Will American industry heed the lesson contained in rich England's industrial eclipse, in poor Germany's steady rise?

MONTICELLO, THE HOME OF THOMAS JEFFERSON, WHERE JACK JOUETT WARNED THE FUTURE PRESIDENT OF THE APPROACH OF TARLETON'S RAIDERS.

AN OPENING FOR A POET

By

HENRY M. HYDE

Jack Jouett's ride, famous in Virginia, deserves national recognition as well. Recently one of the big motion picture companies staged this remarkably daring episode in the history of the Revolution, at Charlottesville, Virginia. The illustrations used in this account were taken from the motion picture film.

IN the good old days in New England whenever a man did anything out of the ordinary—which was not in itself absolutely disgraceful—one of the members of the Concord School of Advertising Experts was instantly on the spot to write a ballad in celebration of the hero and his deed. Boston being at that time the center of knowledge and learning—by virtue of which it controlled the school book publishing business—each ballad in its turn was immediately inserted in the Fourth Reader. When, under the direction of New England school teachers, the poem had been publicly recited by a member of five or six successive high school graduating classes in a hundred parts of the country, subscription papers for the erection of a monument to the current hero were opened in New York, Chicago, St. Louis and Cincinnati, and presently, with nothing more than thrifty receptiveness on its own part, some obscure New England village has had an artistic and expensive marble or bronze statue set up in its court house square, with a verse from the poem engraved on its pedestal.

Thus it comes about that New England is today the national Valhalla; the great outdoor Westminster Abbey; the Mecca of the Daughters of the American Revolution and of all prior and subsequent patriotic uprisings; the paradise of the

summer tourist. Even in the far interior of Vermont one may find on the crest of a lonely mountain a towering shaft which marks the farthest point to which the stern and rock-bound inhabitants of Boston retreated at the time of the somewhat imaginary bombardment of their city during the Spanish-American war.

What New England owes to the advertising genius of the Concord School, New England itself would be the last to admit.

Consider for a moment—by way of contrast—the case of the South. The South has always been prolific in the production of great soldiers, orators and statesmen. Virginia, alone, wrote the Declaration of Independence; gave to the Continental Armies the battle cry of "Give me Liberty or give me Death!"; brought the Revolutionary War to a successful finish and furnished most of the first half-dozen presidents to the new nation. Its dashing horsemen have performed a hundred prodigies of valor; the bravery of its men has been tested and the beauty of its women toasted since first John Smith stole a copper-colored kiss from Pocahontas under a blossoming dog-wood tree at Jamestown.

But Virginia and the South have always lacked ballad-mongers with the true advertising genius. And it is hereby suggested that any ambitious young journeyman poet who is looking for a favorable opening can find in almost any Virginia county a hundred untouched themes which will surely inspire his muse and fill his typewriter with the divine afflatus. There is hardly a New England instance—immortal now in song and in common memory—which cannot be overmatched for dash, bravery, romance and all that goes to make up real heroism, right here in Albemarle County.

Take the familiar case of Paul Revere. Paul, it appears,

JACK JOUETT WARNING THE VIRGINIA LEGISLATURE TO FLY FOR SAFETY.

was a young watchmaker and engraver, who heard, incidentally, that the British were planning to unload some soldiers from their ships in Boston harbor and make a surprise march on Concord, where they hoped to capture a lot of stores. With the caution characteristic of New England heroes Paul rented a horse from a livery stable and took up his post on the opposite side of the river, where he would be, personally, quite free from any chance of capture. He left to a confederate the job of hanging out a lantern in a church tower to notify him whether the invader was going to make the attempt by land or by sea. When the signal came Paul started. At midnight he crossed the Mystic River into Medford; at two o'clock he reached Concord, fourteen miles further on, alarming the inhabitants along the way. It is a sorry reflection on the condition of his hack that it took him two hours to cover the fourteen miles. Later Paul was captured. After his release he thriftily put in a bill to reimburse him for the loss of his time from the engraver's bench and for the charge made by the livery stable.

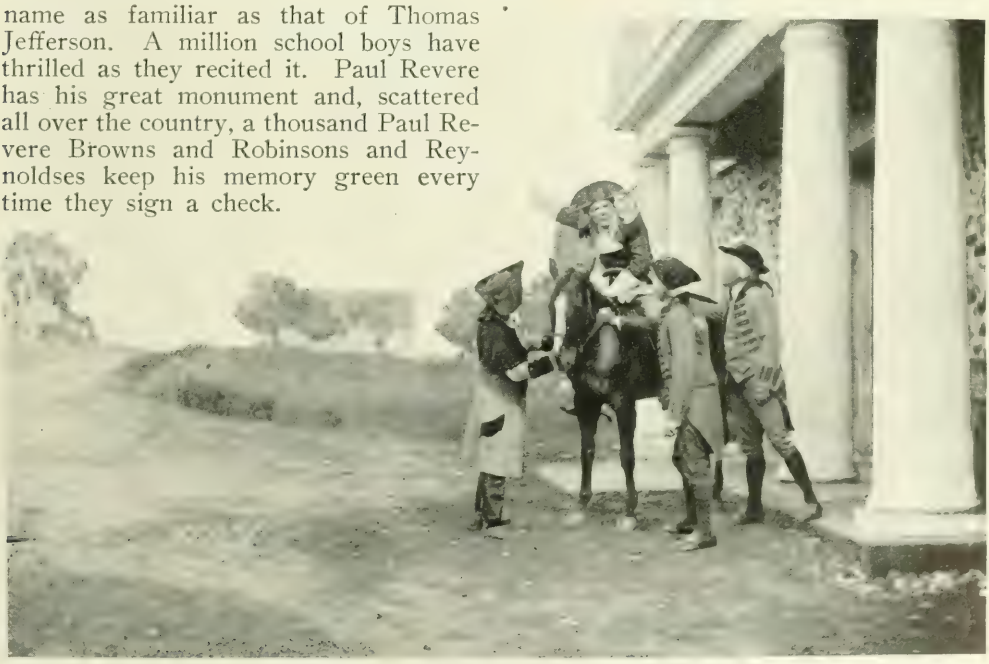
"That was all!" Yet Longfellow's famous ballad has made Paul Revere's name as familiar as that of Thomas Jefferson. A million school boys have thrilled as they recited it. Paul Revere has his great monument and, scattered all over the country, a thousand Paul Revere Browns and Robinsons and Reynoldses keep his memory green every time they sign a check.

But who ever heard of Jack Jouett?

Jack Jouett kept the Swan Tavern on the Court Square in Charlottesville, Virginia. The Swan was the resort of the gentry of Albemarle County and the surrounding country. Its cellars were full of apple brandy and fine old wines and its host was on more or less familiar terms with Patrick Henry, Thomas Jefferson and all the other great men who, on occasion, gathered under his roof.

Also, on his own account, Jack was a bold and dashing blade. He owned a plantation in the adjoining county—Louisa—and there stood in his stable two blood-bay mares famous as the fastest and best-bottomed horses in seven surrounding counties.

It happened in the spring of 1781 that Lord Cornwallis, with Arnold, the traitor, on his staff, was ravaging the state of Virgina, burning the crops and houses and threatening the capture of Richmond, the State capital. With the coming of the blooming month of May the danger that Richmond would be burned and looted became great and the State legislature, then in session, adjourned on May 10 to meet a couple of weeks later



JACK ARRIVES AT MONTICELLO, HAVING RIDDEN TWENTY-SEVEN MILES IN AN HOUR AND THREE-QUARTERS.

at Charlottesville on the edge of the Blue Ridge, where they fancied they would be safe. Governor Thomas Jefferson retired to his country seat on the top of the mountain looking down over Charlottesville and the legislators scattered temporarily to their plantations. When they met again on May 24 in the Eagle Tavern in Charlottesville—Patrick Henry, Richard Henry Lee and Benjamin Harrison, ancestor of two future presidents and of two mayors of Chicago, among them—things had gone from bad to worse. The Marquis de Lafayette and Baron Steuben, the French and German commanders of the Continental Army in Virginia, had been forced to retreat and Cornwallis was fighting and burning his way up the North Anna River into Hanover County.

When the middle of June arrived forty members of the legislature and Governor Jefferson were still in daily session trying hard to provide means to pay, clothe and feed the scattered and discouraged army. Then early one morning Jack Jouett put the saddle on his bay mare and started to ride thirty miles down the Milton road to visit his plantation in Louisa County. Because the times were so upset he carried a loaded pistol in his holster. Midway of his journey, loping along through a great stretch of oak and chestnut timber, Jack's quick eye caught a glimpse of something big and bright blue trying to hide in the woods. A touch of the spur, a pull at the reins and Jack's mare had jumped the worm fence and was dashing off at right angles to the road. Presently he came up behind a man on horseback—a man in a bright blue uniform, with a horse tail floating from his helmet. His big black charger was doing its best to carry him to safety, but Jack's mare was too fast.

"Halt!" cried Jack, with a round oath. "Halt or I'll fire!" The fugitive stopped and turned. "One of Tarleton's raiders, I see," said Jack, with his finger on the trigger. "What are you doing here?"

"I'm lost. I've been riding through these woods for two days."

Jack grinned. "I like the cut and color of your uniform mightily," he said.

THE BRITISH ARRIVE AT THE TAVERN TOO LATE. THE VIRGINIA LEGISLATURE HAS ESCAPED.

CORNWALLIS SURRENDERS TO WASHINGTON AND THE REVOLUTIONARY WAR ENDS.

"Take it off. First of all I'll trouble you for your weapons."

Ten minutes found Jack Jouett transformed into the semblance of a British trooper, even to the top boots and metal helmet, while the dragoon, relieved that he had not been killed, dressed himself in Jack's discarded suit of homespun.

"Now since you're lost," Jack told him, "I'll leave you to find your way out on foot. You'll be in less danger in my old clothes." With a wave of his hand he rode away leading the black horse of his captive by the bridle.

After stopping a couple of hours at his plantation, where his uniform created first alarm and then amusement, Jack rode on to the Cuckoo Tavern at the cross roads to spend the night. Before 6 o'clock the next morning he was awakened by the stamp of hoofs and the rattle of steel in the road outside. Peeping down through a hole in the wooden blind Jack saw the long column of Tarleton's Black Horse Dragoons just coming to a halt. As he looked the great Tarleton, himself,—feared and hated by every patriot as the most cruel and destructive of guerrilla chiefs—swung down from his charger and went clanking into the tavern tap-room, followed by members of his staff.

Out of the back window went Jack Jouett—only half dressed—and by way of the Virginia creeper climbed down to the shelter of the box hedge which grew just outside the tap-room. At the small table within Tarleton and four of his officers sat noisily down, while the host of the Cuckoo, himself, hastened to serve them wine.

"To the author of the Declaration of Independence!" cried the grim-faced chief, raising his glass. "We'll bring him back in fetters to my Lord Cornwallis."

"And that wild rebel, Patrick Henry," broke in another officer—"who wanted liberty or death—we'll give him half of what he asked for."

"By God's blood!" swore Carleton, warming with his wine, "we'll catch the whole rebel crew and so put an end to their vile insurrection! Send a squad and search the stables of mine host, here. We shall be the better for some fresh horse-flesh. And then to saddle. We've thirty miles to ride to reach Charlottesville."

Back to the stable slipped Jack Jouett and cinched the saddle on his bay mare. As he turned to lead her out into the pasture lot he heard the noisy troopers entering at the front. A touch on the flank and she had cleared the fence,

jumped a wide gully and was away through the woods, with the destiny of the future republic depending on her speed and bottom.

Jouett knew an old abandoned road—a deserted path full of deep holes and barred by windfalls. But it would give him a chance to carry the warning, unsuspected by Tarleton and his men. Five miles out from the Cuckoo Tavern it crossed the main highway and so fast was the column of Tarleton traveling that the advance guard caught sight of Jack and his mare as they dashed across. For a couple of miles they chased him through the woods, firing as they ran. But the bay mare was too swift and its rider too good a horseman to be captured. Presently the dragoons were distanced and Jack, unhurt, rode on, certain now that every minute might mean success or failure for the Colonial cause. Not until he reached the Milton ford over the Rivanna did he stop to breathe his mare. Then the high top of Monticello was in plain sight and behind him lay twenty-five miles of his journey, covered in an hour and a half—a sad reflection on the comparative speed of New England horseflesh.

A sip or two of water, a pat on the neck, and the good mare labored on up the steep slopes of the mountain to where in the center of the broad top stood the low, brick manor house. Jack Jouett, himself far spent, beat impatiently on the door. It was instantly thrown open by a tall slender man in a blue coat, lace at his wrists and throat. The indignant look in his blue eyes changed as he recognized the wearied messenger.

"You, Jouett?"

"Your Excellency," bowed Jack, "Tarleton's raiders are riding up from Louisa County to capture you and the legislature. They are hot on my trail."

Mr. Jefferson looked at his watch. "It lacks ten minutes of 8, Jack," he smiled. "And your horse is already blown. How far have you ridden to warn me?"

"From the Cuckoo Tavern. I left there at 6."

"Twenty-seven miles in an hour and three-quarters! No wonder your mare is spent. Come, dismount. You must have a fresh horse and a glass of wine."

Jack Jouett shook his head. "No, Your Excellency. My mare will carry me still to Charlottesville. And there is not a minute to lose. The black horse troop is coming fast."

Ten minutes later the future president, mounted on his French barb and accompanied on horseback by his black body-servant, rode out of the gate of Monticello and started to climb the steep slope of Carter's Mountain across the road. For ten miles its thickly wooded summit stretches across the county to the southwest and on its far slopes there are still standing half a dozen manor houses which claim the credit of sheltering Jefferson for the next forty-eight hours.

In the Court Square at Charlottesville Jack roused the still sleeping statesmen at the Swan and Eagle taverns, tore others from their breakfast, and within an hour the State legislature of Virginia had met in the old court room, still standing, and adjourned formally to meet the next day at Staunton, forty miles away across the Blue Ridge.

In an upper chamber of Jack's own tavern, the Swan, lay General Stevens of the Continental Army, recuperating from a wound received at the battle of Guilford Court House. He was but barely able to sit a horse.

"Come, General," said Jack, "put on this suit of worn homespun and ride with me. I'll not have a guest of mine fall into the hands of Tarleton."

Pale and unshaven as he was, General Stevens rose and obeyed orders. Jack mounted him on a slow-pacing farm horse, throwing a sack of grain across behind the saddle. For himself he wore his best coat, with brass buttons, and rode his second bay mare, sister in blood and bottom to the first. Side by side, the soldier disguised as an ancient farmer, and Jack a fine figure of importance, they rode slowly out the Ivy road in pursuit of the fleeing legislature.

Before 10 o'clock Tarleton galloped into Charlottesville, furious to find not only Monticello, but the nest of rebel statesmen empty. From a frightened darky they learned the route of escape and a picked squad of twenty troopers rode hard out the Ivy road. At Mechem's River Jack and his companion came into sight. Turning in his saddle

as the dragoons charged down the hill Jack Jouett waved his hand in defiance and put spurs to his horse. The frightened old farmer turned his sorry nag into the ditch to make way for the fierce assault and, with such a dashing and defiant horseman before them not one of the band stopped to pay the least attention to him.

For a dozen miles through the mountains Jack led the angry troopers, stopping at Afton on the crest to wave back again a taunting defiance. Meanwhile General Stevens had quietly turned aside from the main road and found safety with a patriot planter.

Jack Jouett lived to see his country's freedom, the man he had rescued President of the United States, and died full of years, a man of substance and solid importance in the community. Always he laughed at the idea that he had done anything worthy of celebration. His son, Jack Jouett, Jr., removed to Kentucky and from the family sprang a Rear Admiral in the Navy of the United States.

Of Jack Jouett and his ride there remains no memorial save a little brass tablet set into the walls of the Redlands Club at Charlottesville, which stands on the spot where bold Jack kept the Swan Tavern in the brave days of old.

Doubtless if some poet will first put Jack and his bay mare into rhyme, and have the poem printed in the school books, New England will start a subscription for the erection of a fitting monument to their memory.

We are learning that industrial prosperity depends in the long run on a kind of efficiency that aggregations of capital, however imposing, cannot by themselves supply, and that in very many of the most desirable industries the secret of success is in the trained intelligence and disciplined taste of the man who does the work; that the development of these powers in the workmen of the future is an important branch of general education, and its active promotion and adequate support a legitimate public concern.

—Leslie W. Miller.

A BUILT-UP ROAD ON THE EDGE OF THE FLORIDA EVERGLADES, NEAR MIAMI.

PARADISE ON INSTALLMENT PLAN

By

GEORGE T. ODELL

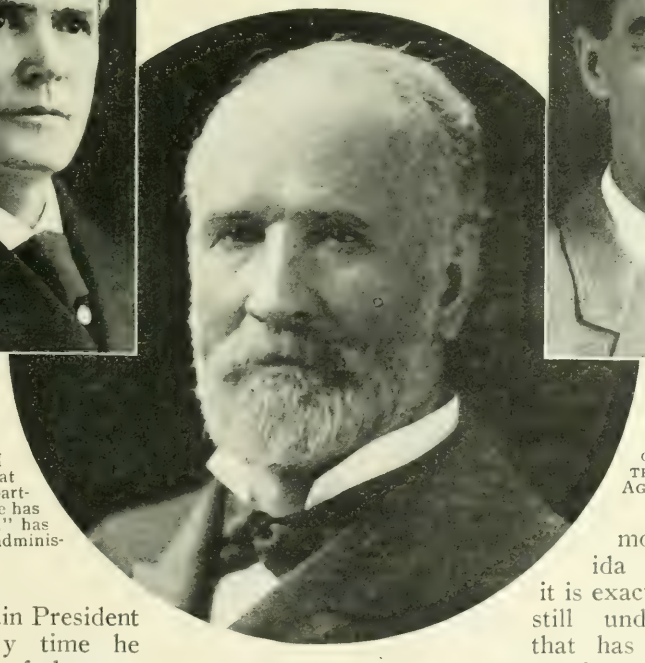
"MILLIONS of dollars have gone into the pockets of land sharks for land that is eight, ten and twenty-one feet under water, land that ought to have been sold by the quart, instead of by the acre, and I want to know what connection the Department of Agriculture has with these bummers and land sharks."

Congressman Frank Clark of the Second District of Florida, rose one day recently in the House of Representatives and with a single sentence shattered at least 40,000 dreams of paradise on the installment plan. He did more than that. He made plain to 40,000 people that all their little savings had been thrown away; and he put his finger on a sore spot in the national administration which will

GROWING GARDEN TRUCK ON THE SHORES OF LAKE OKECHOBEE.

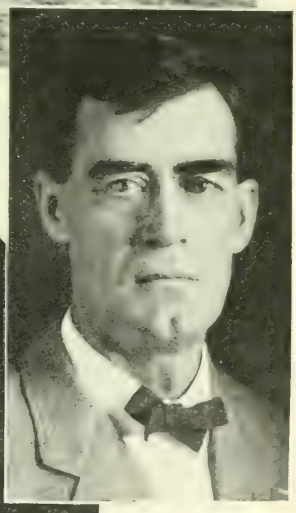
CONGRESSMAN FRANK CLARK OF FLORIDA.

His question: "I want to know what connection the Department of Agriculture has with land sharks," has embarrassed the administration.



JAMES WILSON, SECRETARY OF AGRICULTURE.

He is reported to have said he is not running his department "for the protection of fools."



R. W. MOSS, CHAIRMAN OF THE HOUSE COMMITTEE ON EXPENDITURES OF THE DEPARTMENT OF AGRICULTURE.

continue to pain President Taft every time he catches sight of the professional gray whiskers of that gorgeous old pseudo-farmer, "Tama Jim" Wilson, perpetual head of the Agricultural Department and enemy of Doctor Wiley.

Congressman Clark knew what he was talking about. His district includes most of the Florida Everglades and it is exactly this vast and still undrained swamp that has been parcelled out in ten acre slices to tens of thousands of clerks and stenographers and school teachers all over the United States. And there can be no doubt that in the perpetration of this particularly mean and nasty swindle the land sharks had something more than the passive acqui-

escence of somebody high in authority in the national Department of Agriculture.

Some months ago the department issued a circular from which the following is an extract:

"The drainage of the Everglades is entirely feasible from an engineering standpoint, but the value of the lands when drained is still largely problematical. Provision must be made for irrigation in order that there may always be sufficient moisture for the production of crops and to prevent the liability of the muck catching fire."

U. S. Government Plant Laboratory at Miami.

Two men walked into the Department of Agriculture one day, waving this circular, with the objectionable paragraphs heavily underlined in red. The two men were engaged in selling Everglades land. They declared that this circular would ruin their business. They demanded that it be suppressed. The department had spent $11,000 in making the investigation on which the circular was based and C. G. Elliott, Chief of the Drainage Engineers of the Bureau, naturally was not greatly impressed by the complaint of the land agents. They departed, breathing fire and wrath and declaring that they would take the matter up with "Tama Jim," himself. It might be difficult to prove just what followed, but the blatant fact is that the objectionable circular was suppressed by somebody "higher up." In whatever way, the land sharks gained their point. Nor was that all. The land sharks presently sent out another of their wonderfully seductive circulars, in which they quoted what purported to be an extract from the official report of the Department of Agriculture, painting the future of the Everglades in most brilliant colors. A report containing the glowing prediction had been, indeed, prepared but had never been published, because the heads of departments who read it would not "stand for" what they considered the unduly optimistic statements it contained. But, in some unexplained way, the report fell into the hands of the land sharks, who used it in their advertising matter with most telling effect. When, presently, an official statement was prepared with the idea of at least partially counteracting the effects of the so-called "Wright excerpt," it was summarily suppressed, again by the orders of somebody "higher up."

And "Tama Jim," himself, when a congressman presumed to question the action of the department, replied that he was not running his department for the protection of fools.

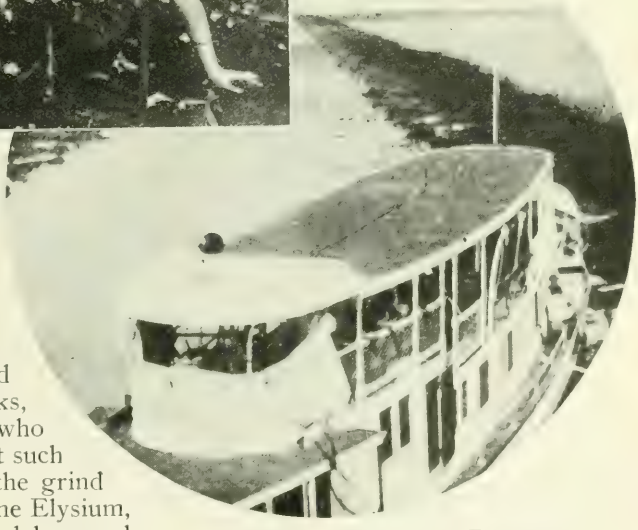
Just how nearly that description fits the people who have put all their savings into "ten acres of paradise" and just how much they need protection may be gathered from a description of the methods of one of the largest of the Everglades land companies.

About three years ago, before any serious attempt had been made to drain the swamp, a man, who had had some experience in the land business out west, bought from the State of Florida, 500,000 acres of these glade lands. He contracted to pay for it, at $2 an acre, with an agreement from the State that it would spend $1.50 of this purchase price for drainage and reclamation. Of course the land was utterly worthless until it should be reclaimed, but in draining the 500,000 acres, the State officials believed they could drain the other 2,000,000 as well. A tax of five cents an acre was also levied on all the glade lands to help pay for the improvements.

The man who bought the land also got it on the installment plan, only the bargain he made with the state was better than the one he afterwards gave to the small investor. He has until 1916 to pay for his land and the payments he made during the first two or three years of the contract were comparatively small. He did not, however, wait until he had paid for the land before he began to sell it; he did not even wait until the land had been

PART OF THE GOVERNMENT PROPOGATING ESTABLISHMENT AT MIAMI.
This is located on high ground and the Department of Agriculture has made no experiments in crop growing on glade lands. Land sharks show this farm to "prospects" for glade lands as typical of what can be done.

HOLIDAY-MAKING IN THE EVERGLADES.



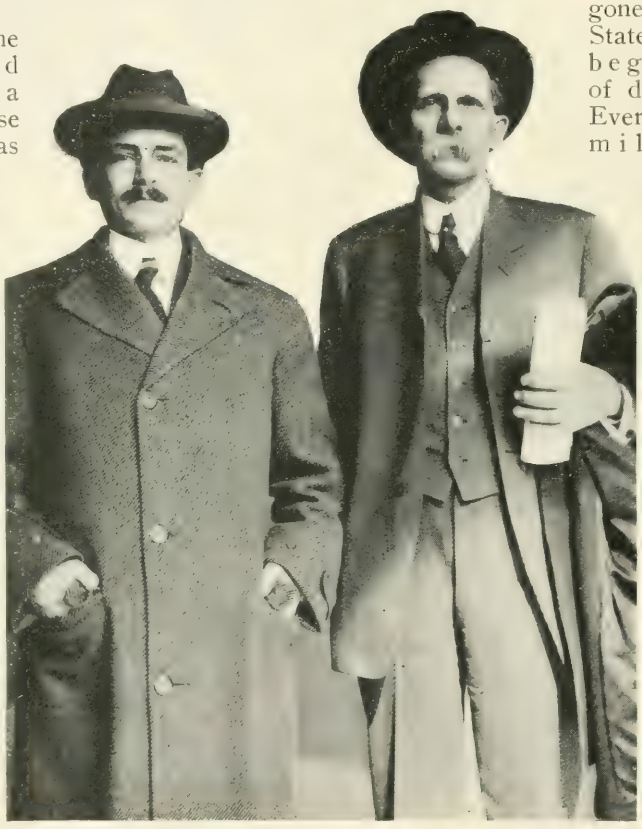
A DRAINAGE CANAL IN THE EVERGLADES.

drained before letting an eager public in on his good thing at an advance of 1,250 per cent. As soon as he made his initial payment to the State he organized a selling company and proceeded to unload it upon the clerks, stenographers and others who appeared to be waiting for just such a chance to get away from the grind of city life and were seeking the Elysium, where nature doeth all the labor and man hath but to gather in the harvest. This man had the Elysian fields for sale in ten-acre tracts at the modest price of twenty-five dollars an acre and he was willing to become their benefactor, incidentally getting the money with which to meet his payments to the State and having a nice profit besides. The contracts which he made were not for specified tracts, but merely guaranteed the buyer ten acres somewhere in the Everglades. It was a scheme of financing that would have done credit to a Wall Street promoter.

Last year they had the first drawing of lands at Fort Lauderdale. There had been about 16,000 of these contracts sold, which meant that 160,000 acres which had originally cost $320,000, had been disposed of for $4,000,000, or four times the cost of the whole 500,000 acres. Not all of the purchasers were able to go down there for the drawing, so some of them clubbed together and sent representatives. Nevertheless, there was a gathering of several thousand persons and there were no accommodations for any such influx. The people lived in tents or in shacks that sprang up over night and the excitement was as intense as in a boom town.

The drawing was to be by the lottery system, and the big map, hung in the hall where the drawing was to occur, was marked in numbered squares, representing the ten-acre tracts which each contract holder was entitled to. The drawers of certain lucky numbers were to get extra allotments of land, and each contract holder was given a town lot in a town which it was proposed to establish.

But, after the allotment had been made, a question arose as to who was going to survey the land and subdivide it into these separate ten-acre plots. The State was ready to divide it into townships and ranges, but would not agree to divide it into sections. The contract holders appointed a board of trustees to represent them and they started to negotiate with the seller. He agreed, that when the State had surveyed the land, he would place a stake or monument in the center of each section, and all other expenses of the survey would have to be borne by the contract holders. That still left the question open of who was going to pay for the survey of the sections and there was considerable friction between the seller and the trustees, which finally landed in the courts.



C. G. Elliott, at Right, Former Chief of the Drainage Engineers, and A. D. Morehouse, Assistant Chief.
Elliott was not greatly impressed by the complaint of land agents who wanted the truth about the Florida Everglades suppressed.

Such questions as these however, can be settled. They are not vital, although it will entail considerable extra expense on the part of the contract holders which few of them can afford. It is also important as indicating the methods of these land companies and of showing to what extent they should be regulated. But, the main question is, whether the people who have bought these lands have been swindled, and if so how?

Three years have gone by since the State of Florida began its work of draining the Everglades. One million dollars has already been spent and yet the work is only about one-quarter completed, and it will be several years before the State can fulfill its part of the contract. The engineers for the State admit that already the cost has been about twice as much as was originally planned. But, even when the main canals have been dug, and the surface of Lake Okechobee has been lowered so that it will no longer overflow during the rainy season, the land will not be drained, except for the few acres lying immediately adjacent to the canals. The owners of these ten-acre tracts will have to join together to dig lateral canals to carry the water from the Everglades to the main channels, and then each farmer will have to put in a system of ditches for drainage and irrigation on his own small plot.

True, all the engineers are agreed that it is feasible to drain the Everglades, but drainage alone will not produce fertile land. There must be irrigation and just how that is to be accomplished is a question on which the engineers are not at all agreed. Irrigation in any form is expensive to install, and it must be remembered that for nearly every one of these contract holders this ten-acre plot represents almost his entire savings and a great majority of them are without practical experience in farming.

One engineer who has had wide experience in drainage propositions said: "I believe there is no project in the world where drainage and irrigation are carried on in the same canals at the same time by gravity. The difficulty would be in maintaining the stage, because of the tremendous rainfalls at certain seasons, so that water could be held at proper levels under the surface. There is no drainage project in the world like that of Florida."

Speaking of the cost, this same engineer said: "I believe it will turn out to be a pumping proposition with pumps on each tract, and it will cost twenty-five to thirty dollars an acre. It will require special knowledge of muck lands to cultivate them."

Even the State engineers are ready to admit that there could be no diversity of crops, and that all the farmers would have to agree to raise the same crops, as the same level of sub-surface water must be maintained on all the land under their scheme of gravity drainage and irrigation. One engineer declared that he believed the land was best suited to raise sugar, but who ever heard of anyone making a living out of sugar on a ten-acre farm?

"I believe that the Florida Everglades can be reclaimed, but it will have to come gradually through years of work, the gravity system of drainage will have to be supplemented by a pumping system of irrigation, and years must be spent in subduing the light muck lands, fertilizing them, and packing them down as was done in the north," said a man of wide experience in this sort of work.

What the future of the Everglades will be no one knows. What treatment will be necessary for the land, how much fertilizing, how much irrigation, how much draining, what crops can be raised and whether these can be marketed quickly and economically, are questions that cannot be answered until the Everglades have finally been drained, and then only after a long period of experimentation. But there is one thing certain, the dreams of those who have scrimped and saved to buy these "doily farms," that they might retire to a life of ease and comfort, of luxury even, living off the harvests of their rich fields in a land of sunshine and salubrious climate, will long be unfulfilled. How many of these silly persons who bought their land "sight and unseen" will have their tiny patches when the time comes that the Florida Everglades is transformed into fertile farms?

Florida has suffered too. There are fertile lands in the State, lots of them, and it is probably destined to be a great agricultural State, but not through these poor deluded people who bought land by the acre which should have been sold by the quart.

AN AMERICAN CONSULATE IN A FAR-AWAY LAND—TIENTSIN, CHINA.

HAS RE-MADE THE CONSULAR SERVICE

THE American Consular Service has been organized on a business basis for hardly more than half-a-dozen years. It has been taken wholly out of the "spoils" system, and appointments and promotions are made on merit exclusively.

It is a well-paid system, too. There are two consul-generalships, at London and Paris—the best paid of the jobs—at $12,000; fifty-five consul-generalships at from $8,000 down to $3,000; eleven consulships at $5,000 to $8,000, and two hundred and thirty more at salaries running all the way from $2,000 to $4,500. Promotion for efficient service is sure, and nobody is "fired" except for cause. What other kind of government work offers as good inducements?

The service, as it stands today reorganized, is largely the creation of Wilbur J. Carr, who has been at the head of it since 1907. He is a comparatively young man—born at Hillsboro, Ohio, forty-one years ago. Graduated at the University of Kentucky, he afterwards studied law in Washington, and took a special course in international law and diplomacy. He is the right-hand man of the First Assistant Secretary of State, and one of the cogwheels of that skillfully-managed and easy-running Department of the government service.

WILBUR J. CARR.

The consuls are the business agents of the government abroad. Last year the Service cost $1,954,644. But, to offset this expenditure, $1,712,345 was received in fees of Consular services, so that the net expense was surprisingly small. Formerly, the fees went to the consuls, many of them getting no other pay, but this practice has been done away with for the good of the service.

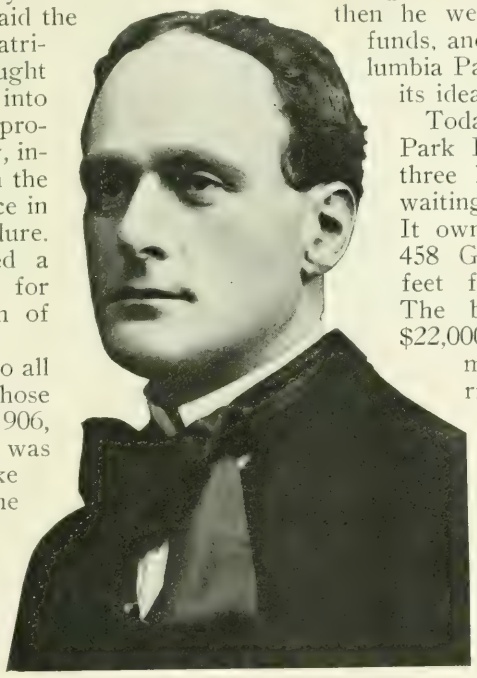
A FRIEND OF BOYS

BOYHOOD'S best friend on the Pacific coast is Maj. Sidney S. Peixotto of San Francisco.

The Columbia Park Boys' Club of San Francisco is Major Peixotto's dream of twenty years come true. The dream and the club were both born where they were most needed, south of Market Street. That was where boys lived whose recreation ground was the street; whose social horizon was bounded by the dance hall and the saloon.

At the outset Major Peixotto eliminated all financial cost to the boy. Everything was free to any decent boy between nine and fourteen. He leased and remodeled a building. He equipped a small gymnasium. He organized a military company and built up a boys' band. He laid the foundation for boy theatricals that have since brought thousands of dollars into the club treasury. He provided pictures, a library, indoor games, training in the manual arts and practice in parliamentary procedure. In a word he created a beautiful club home for boys who lived "south of Market."

It took a decade to do all this. And then, on those fateful days in April, 1906, when San Francisco was shaken by earthquake and swept by fire, the common catastrophe did not spare the Columbia Park Boys' Club. Everything went.



MAJOR S. PEIXOTTO.

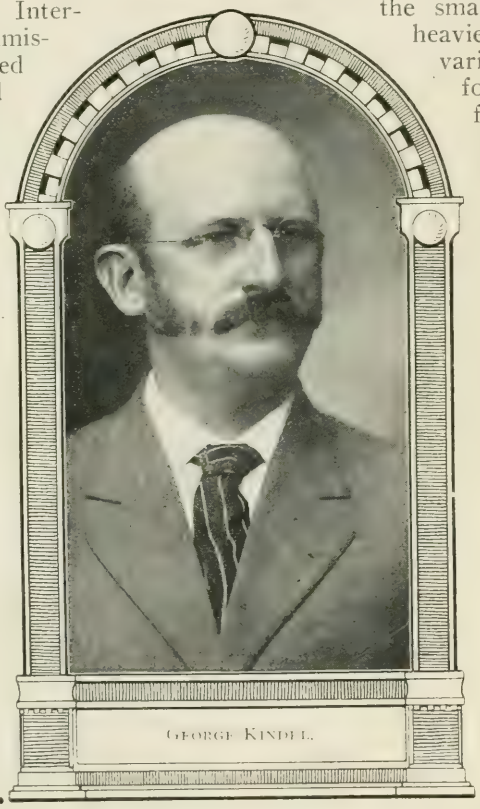
Major Peixotto began again. He found the boys and brought them together again; then he went East and raised funds, and once more the Columbia Park Boys' Club faced its ideal.

Today the Columbia Park Boys' Club numbers three hundred and has a waiting list much longer. It owns its own home at 458 Guerrero Street, 130 feet front by 160 deep. The building alone cost $22,000. The club has its many activities; theatricals, athletics, music, military drills, track and field sports and many others. It now goes to the country in the vacation period in three or four divisions; tramping the highways of California, coast and valley and mountain, eating and sleeping in the open and paying all expenses by giving theatrical entertainments on the way. It stands today, six years after its reincarnation, the model boys' club of the Pacific coast and the pride of San Francisco.

Vision plus power equals achievement. Some men see visions and dream dreams. Many men have more or less power of accomplishment. But where both dream and creative energy come together in one man, then things take place. Major Peixotto has this two-fold gift—the gift of vision and the power to actualize the vision.

BUSTER OF FREIGHT RATES

THERE is a mutton-chop David, one George J. Kindel, whose very name is a terror to the big railroad systems. For twenty years Kindel has been fighting—generally singlehanded—for more equable freight rates west of the Missouri River. He has appeared before low courts and high, and he has had lengthy sparring bouts with that august railroad tribunal, the Inter-State Commerce Commission. He has battled with one great railroad system after another to the very Supreme Court of the United States, and he has made more than one acknowledge defeat.


GEORGE KINDEL

"There's a lot of buncombe about this freight making business," asserts Kindel. "Rates are made just because they are made—that's all. Some railroad authority has put such and such a rate in effect, and there it sticks and nobody dares try to change it. I've never had anybody tell me that it's right to charge more for throwing a thing off at Grand Junction, Colorado, than it is to carry the same thing through Grand Junction to California and back again.

"I was led into this subject twenty years ago when I got to examining the question of freight rates and was struck by the many incongruities on the tariff sheets. I am a comparatively uneducated man, and I haven't carried on the fight in high-brow fashion. All my questions have been plain enough, which perhaps is the reason why the experts find them so hard to answer. In arguing before the Inter-State Commerce Commission I am often handicapped by lack of evidence. I can get plenty of the unofficial kind, but it takes courage for a business man to testify against a big railroad.

"If there's anything worse than freight rates it's express rates. There is a big express company that does most of the business in Mexico. Its rates in the United States are adjusted, like the rates of the other companies, so the small shipper pays the heaviest charges. The variations in the charges for packages ranging from one to ten pounds in this country are very large, but when one gets to the larger packages, shipped by the wholesaler and manufacturer, the variations are smaller, thus giving the big man the best of it. But as soon as this express company crosses the Mexican line its rates are so adjusted that the charges are greater on the large packages than on the small ones."

Occasionally Mr. Kindel jumps into politics and when he does he makes a big splash. He has held various offices in Denver, and a year or two ago concluded to run for Congress. It was at the eleventh hour, and there was no ticket he could get on but the Prohibition, which usually polls a scant 4,000 votes. Kindel got 17,000 votes and came so near getting in that the bosses didn't get over their scare for weeks.

"Some day I'll go to Congress from Colorado," says Kindel, "and I'll bring this freight and express fight before the nation in proper style. Meanwhile I'm finding that the man whose cause is just can do a lot singlehanded."

ELECTRIC LIGHT AS USED FOR TREATING NEURITIS IN THE ARM.

GIVES WORKERS SCIENTIFIC CARE

THE government Printing Office at Washington, with its thirty-five hundred employes—a large proportion of them women—under one roof, is one of the biggest factories in the world, its output being books and all manner of documents published under the direction of Congress.

Within the last few years it has become a sanitary model, under the direction of a medical superintendent, Dr. William F. Manning, who is a man of original ideas. He has carried them even into such details as contrivances of his own invention for cleaning the thousands of cuspidors daily with live steam. There is no chance for infectious disease of any kind to get a start in the huge establishment, where the very latest and most up-to-date hygienic methods are rigidly enforced. But almost every day it happens that a few out of the army of work people are taken sick or suffer some injury, and they are immediately brought to the emergency hospital which, on a small scale, is maintained on an upper floor.

The little hospital is equipped with every imaginable kind of apparatus for relieving sufferers, no matter what the trouble may be. There are even oxygen tanks, for use in cases of threatened heart-failure; and for rheumatic or other pains Dr. Manning has a special contrivance which concentrates the rays of a powerful electric lamp upon the part affected—this being found highly efficacious. But the most interesting of his inventions is a cooling device, for use in

Dr. Manning's Wet Sheet Apparatus for Cooling Rooms.

hot summer weather, which consists of a wide sheet of muslin, stretched lengthwise of a room, overhead, and in a vertical plane, which is kept wet by a steady flow of water, the latter being caught beneath by a trough running along the bottom of the sheet.

By this means, even when the temperature outside is one hundred degrees or more in the shade, Dr. Manning is able to keep the little hospital very comfortable. He has found that the same thing can be done in the great typesetting rooms, to the relief of the hundreds of workmen there employed. But the most important claim he makes in behalf of the invention is that it costs almost nothing at all, and may be utilized—it is not patented — by the poorest people, anywhere.

Dr. William F. Manning.

The medical appliances and apparatus in connection with the government Printing Office are models, and could be well adopted to great advantage by the various factory owners of the country. Dr. Manning has built up an excellent system.

THE UPPER PHOTO SHOWS THE FIRST TRAIN CROSSING THE COMPLETED BRIDGE OVER THE COLUMBIA RIVER AT CELILO; THE LOWER, ENGINEERS CROSS-SECTIONING IN THE DESCHUTES CANYON.

RAILROAD WAR IN THE MOUNTAINS

By

SHAD O. KRANTZ

THE almost perpendicular cliffs towered up fifteen hundred feet above the angry rushing water. Along a narrow trail on the east side of the canyon a legion of Greeks and Italians, armed with drills, pickaxes and dynamite were hewing and blasting a forty-foot shelf out of the rock wall. Suddenly a big boulder, falling apparently from the clouds, struck close to them. The men scattered like frightened quail. A whole rain of falling rocks struck where they had been standing. An unseen and desperate enemy was rolling boulders down over the edge of the cliffs.

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THROWING A CANTILEVER BRIDGE ACROSS CROOKED RIVER, ON THE OREGON TRUNK LINE.

JOHN F. STEVENS, WHO LED THE HILL FORCES IN THE RAILROAD WAR AGAINST HARRIMAN FOR THE CONTROL OF CENTRAL OREGON.

A few nights later a rival camp of aliens, on the opposite side of the canyon, was thrown into a panic by the discovery of a "plant" of dynamite close to their sleeping quarters.

For a year—unnoticed and unknown to the world outside—a war went on in this remote wilderness which for bitterness and ferocity has rarely been equalled. On either side were bold and resourceful men, backed by towering ambition and the sheer weight of millions of dollars. Time after time bands of Greeks and Italians were hurled against each other in a country where a misstep meant death on the rocks below or drowning in the foaming rapids of the mountain river. Automobiles, loaded with sheriffs and other rival law-officers, went spinning along mountain trails, unvisited before by anybody but wandering prospectors. Hundreds of thousands of dollars were spent in buying up old railroad charters and rights of way. Hundreds of laborers, pouring out of box cars at the nearest railroad terminals, went marching on foot across miles of desolate and uninhabited country. Great trains of four- and six-horse wagons toiled over the high, unmarked plateaus. Processions of burros, laden with high explosives, crept over the mountains, following a bell-mare, unattended by men because a slip or a misstep would have blown them all into eternity. Daring young engineers let themselves down

with ropes over the sides of towering cliffs to stake out rights of way on the sides of the mountain.

The prize for which the Deschutes War was fought was the control of the great inland empire of Oregon, a virgin and undeveloped country almost as big as the whole state of Indiana. The rival powers were Hill and Harriman.

The captains in the field on either side were as big as their jobs. First to appear was a mysterious stranger from the East, who registered at the country hotels as John F. Sampson. He fished for trout at various points along the Deschutes and cursed his bad luck. He rode up and down the canyon, bought several ranches here and there and developed an amazing willingness to give up good money for old and useless railroad grants. Presently when the war was under way he went to Portland and, in the dusk of a Saturday evening, made an appointment with "Billy" Nelson, a young promoter to meet him under the trees of the city park. There in the shadows of the night the mysterious stranger made Nelson's fortune by calmly handing over a perfectly good check for $150,000 in return for Nelson's controlling block of stock in the abandoned and presumably worthless Oregon Trunk Line railroad, which had been planned to run down the east bank of the Deschutes canyon. That in his control, Sampson announced himself as John F. Stevens, fresh from his work in charge of the Panama Canal, with James J. Hill as his backer in the pending struggle.

On the other side were the Harriman interests. Chief in the field was George W. Boschke, the man who built the great sea wall at Galveston. And while Boschke was leading the fight in the Deschutes canyon occurred an incident which fairly measures the mettle of the man.

Boschke was in camp, forty miles from a railroad. A weary messenger, riding a panting horse, rode in and handed to an assistant a telegram. With fear and sorrow the assistant laid the message before his chief. It announced that

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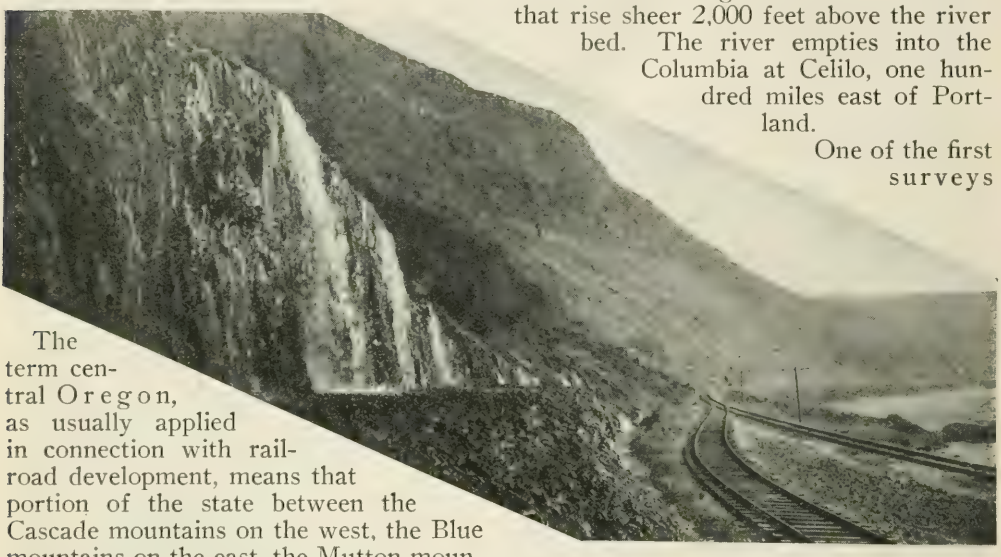
HORSESHOE CURVE IN THE DESCHUTES CANYON.

The Oregon Trunk line follows the river. The Harriman tunnel cuts through the neck of the horseshoe-shaped peninsula.

the Galveston sea wall had been swept away in a second furious hurricane.

Boschke glanced up smiling from its reading. "This telegram is a lie," he said, calmly. "I built that wall to stand." Then he turned to the work in hand. "Double the force on mile seventy-five," he ordered. And the telegram was a lie. The alarming message was based on a false report. The sea wall had stood firm against a storm equal in severity to that which originally destroyed the city.



SPRINGS GUSH FROM THE SIDES OF THE DESCHUTES CANYON.

The Oregon Trunk line built a water tank by erecting walls from ledges of rock one hundred feet above the tanks. The water is held in by these walls.

The term central Oregon, as usually applied in connection with railroad development, means that portion of the state between the Cascade mountains on the west, the Blue mountains on the east, the Mutton mountains on the north and the California line on the south. The country, generally speaking, is a plateau, rising to the south to an elevation of about 2,300 to 4,300 feet above sea level. It contains about 30,000 square miles of promising agricultural and timber land—a most desirable field for railroad activity. The Deschutes river cuts down from the highest elevation through this tableland, reaching sea level at the mouth of the Columbia.

Previous to Mr. Hill's now notable visit to Portland many railroads had been projected into central Oregon, but no actual construction work had been done. A line had been build by the Harriman system, connecting with their main line along the south bank of the Columbia at Biggs, to Shaniko, seventy miles south. This road follows the contour of the country, its profile greatly resembling the teeth of a saw. Another road, owned by private interests, extended from The Dalles, on the Columbia, to Dufur, thirty-five miles south. To extend either of these lines into the interior, was impracticable, all engineers agreed.

Entrance to the objective territory, then, was deemed possible only through the Deschutes canyon, a gorge through the heart of the Cascades, through which the Deschutes river rushes turbulently on its way to the ocean. At places the canyon is so narrow that the river runs "on its edge for hundreds of yards. On either side are high banks of solid rock that rise sheer 2,000 feet above the river bed. The river empties into the Columbia at Celilo, one hundred miles east of Portland.

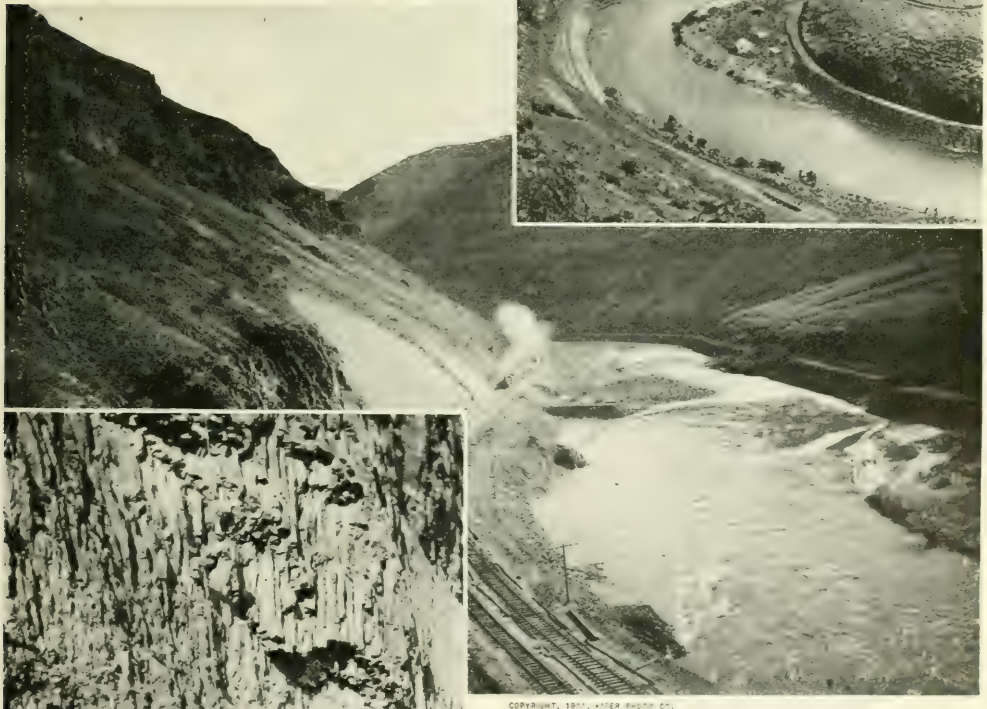
One of the first surveys through the Deschutes canyon was made in 1906 by the Oregon Trunk line, incorporated, which was promoted by "Billy" Nelson, who had been active in various small railroad enterprises near Portland and Seattle. The line followed the Columbia river from The Dalles to the mouth of the Deschutes, thence up the Deschutes and Willow Creek to Madras, about 110 miles south.

About the same time the Harriman interests incorporated "The Deschutes Railroad" and filed maps of a line along the Deschutes river and Trout creek to the plateau near Madras. Two years later the Central Oregon Railroad company filed maps for a line from Madras to Bend, forty miles beyond. In the

same year the Oregon & California Construction company was organized to build the Oregon Trunk line.

Late in 1908 much activity developed in the Oregon Trunk headquarters. Right of way agents were scattered the full length of the canyon. This spurred the Harriman interests to renew their efforts. For many weeks it was a race between the rivals for the strategic points in the canyon, possession of which might have enabled either to prevent the success of the other.

Meanwhile construction work on either side of the canyon was progressing. The Oregon Trunk line was being



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TYPICAL SECTIONS OF THE DESCHUTES CANYON.

WORKMAN—ON THE CLIFF—DESCENDING BY A ROPE.

built by Porter Brothers, Portland contractors who had built Hill's North Bank road, and this gave rise to the suspicion that Hill was interested. Work was in charge of Johnson Porter, a member of the contracting firm, while George A. Kyle, a veteran engineer, was in command of the forces in the field.

The Harriman interests were no less active. They had at the head of their organization George W. Boschke, the

man who built the sea wall at Galveston. Boschke directed the work and had under him an able staff of engineers, headed by H. A. Brandon. The Harriman forces, in fact, were the first of the two to cover the entire field of operations.

"On to Shaniko" became the cry of the Harriman forces and as rapidly as they could they sent their camp equipment to that point. Every train that arrived at Biggs, either from the East or from the West, bore its portion of engineers' and contractors' materials. The crooked little road between Biggs and Shaniko fairly was twisted out of place by the unusual traffic that moved over it—traffic that yielded no direct revenue and that caused an additional loss in the movement of empty cars back to the main line. For none of this heavy stream ever returned. What was not consumed in construction work on the Deschutes came out over the completed railroad through the mouth of the canyon.

James J. Hill Driving a Golden Spike at Bend, Ore., to Mark the Completion of the Oregon Trunk Line to That Point.

First of all in that steady procession between Shaniko and the Deschutes river went the engineers—sturdy blazers of the trail over which a million dollars in tools, machinery, supplies, explosives and equipment was to be hauled. They were trail blazers indeed, for in many instances they were forced literally to cut their way through the thickets, through forests or through rocks.

Camps were established at various points along the river and work was started at each place simultaneously. Five trails were laid out, each radiating from Shaniko. Surveys were made hastily and wagon roads were built almost overnight. Over these the great bulk of material was moved. Ahead of the tools, ahead of the machines and ahead of all the rest went the camp cooks.

Workers were rushed to Shaniko by the trainload but once there they had to make their way across the open and unpopulated country on foot. It took them many days to cover this comparatively short distance and when they arrived at their destination many hardy ones among them were nearly exhausted.

Wood, coal and oil were brought to Shaniko and there loaded on the backs of mules to be carried to the construction camps. A train of these animals was kept in constant service. Explosives were handled in a like manner. The roads were so rough that dynamite and nitroglycerine could not be carried in wagons. In carrying explosives the mules generally went unattended as the rocky roads were too uncertain to permit safe travel. To the credit of these sure-footed beasts it must be said that not once did they fail to deliver their loads.

Transportation of food for both man and beast was a problem that required systematic management and careful attention. The country above the canyon does not produce hay or feed so even this had to be packed in. One train of

wagons was kept constantly busy hauling supplies for the stables.

Canned goods were hauled by the carload. Whenever possible food was prepared on the ground. Flour was hauled in and bread was baked in the construction camps. The fresh meat problem was solved very readily. Steers were bought from Central Oregon farmers and driven overland to the camps where they were slaughtered. Once a heavy steer lost his footing and went tumbling over the rocks to the edge of the river, more than one thousand feet below. His neck and most of his bones were broken in the fall. He landed within one hundred feet of a gang of workmen who rescued the body and made it available for their table.

Similar difficulties confronted the Oregon Trunk construction forces. To reach their various camps wagon trains were operated out of The Dalles. For many months in the summer of 1909 almost a continuous procession of great four horse teams hauled railway equipment moved from The Dalles to the remote regions of the canyon in which camps had been established.

Equipment moved out of The Dalles by wagon was sufficient to establish the camps but when actual construction material was required it was necessary to seek a new base of supplies. The little line between The Dalles and Dufur was pressed into service. The heavy tools and machinery was shipped into Dufur over this line and from there hauled by wagon road to destination. Dufur immediately became a place of much activity. Every train brought in its cars filled with camp material. From Dufur to Sherrar's Bridge it was necessary to travel over mountainous roads. Contractors on the lower part of the work did their own hauling, but wagon roads had to be built from the main highways, zigzagging down the canyon sides to the construction camps. In all, about sixty-five miles of such roads were built at a cost to the two railroads of more than $100,000. Approximately eighty-five miles more of roads were built, at the contractor's expense, from the main camp to haul track material cars, culvert and bridge timber, dynamite and commissary supplies along the grade to the smaller camps, which were scattered throughout the seat of war.

So that they might have an unobstructed wagon road between Dufur and their construction camps, Johnson Porter bought several small ranches through which he built roads. At one or two places conflicting grades made it necessary to close the public highway and for nearly a week, until he had his supplies moved in, Porter engaged in the exciting occupation of avoiding the sheriff of Wasco county, armed with injunction papers, meanwhile directing the work of his men.

Even after the supplies were brought to the high bank above the river contractors had trouble getting them into the canyon below. Zigzag roads were carved out of the rocks some having twenty per cent grades. Wagons were locked in making the descent and heavy timbers were fastened behind so that they might not run away down the hill.

At one time an effort was made to transport material along the river by boats but the first attempt proved disastrous. A gang of six Greek laborers, together with a wagon load of camp utensils were placed on board a raft and started down stream. A rope attached to the raft enabled men on shore to assist in guiding it. The Deschutes river is swift and obsessed with many whirling rapids. The raft had proceeded less than half a mile when it encountered one of these rapids. In an instant it was sucked under the surface and its cargo of freight and excited foreigners thrown into the water. All but one man escaped.

The sides of the canyon are so steep that it is impossible to descend from the heights above without artificial aid.

The engineers overcame this situation by letting themselves down on ropes, but the machinery, supplies and explosives could not be handled in this simple manner. So temporary roads were hewn out of the sides of the canyon. They were dangerous and treacherous at best but they were made to serve their purpose. The Harriman interests alone spent more than $100,000 in building bed roads to reach their right of way before actual construction could be started.

The adopted lines conflicted at several places but no serious difficulty was en-

countered north of "Mile 75" south of the Columbia, where the Oregon Trunk line crossed to the east side of the Deschutes river.

It was impracticable for the Porters to use the west bank of the stream as it would have caused a long delay, first, to get permission from the government to make a survey there, then to get filing maps approved so work could proceed. The Oregon Trunk line for twelve miles south of this crossing to Trout creek unquestionably antedated the surveys of the Deschutes railroad. However, a short distance south of the river-crossing the Oregon Trunk crossed the homestead of a man named Smith which proved a stubborn barrier.

The Oregon Trunk maps were approved at Washington before Smith secured title to his homestead. He had, however, filed on it while approval of the Oregon Trunk maps were pending, so had prior rights. Smith commuted his homestead about this time and sold it to the Harriman interests. This gave them one controlling piece of right of way as the canyon on the east side of the river at this point is very abrupt.

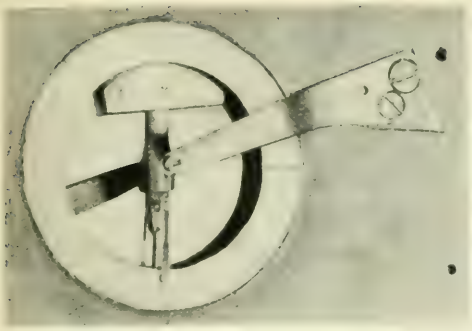
In the face of this situation further progress of the Oregon Trunk was seriously handicapped. But work continued, each side trying to gain possession of the necessary strip of right of way. Physical encounters between men employed in the rival construction camps were numerous.

Soon after Stevens took hold of the Oregon Trunk a compromise was effected with the Harriman interests for use of the conflicting right of way in the canyon whereby a joint track was built. Other difficulties soon were adjusted and both lines completed in two years. A joint track also was built from Metolius, south of Madras, to Bend.

Between Metolius and Bend the Oregon Trunk crosses the Crooked river on a steel arch bridge 320 feet high and 340 feet long. A steel and stone bridge 4,200 feet long carries it across the Columbia at Celilo, connecting it with the North Bank road on the Washington side of the river. Both structures were designed by Ralph Modjeski of Chicago.

On October 6, 1911, James J. Hill drove a golden spike at Bend marking completion of both the Oregon Trunk and Deschutes railroads.

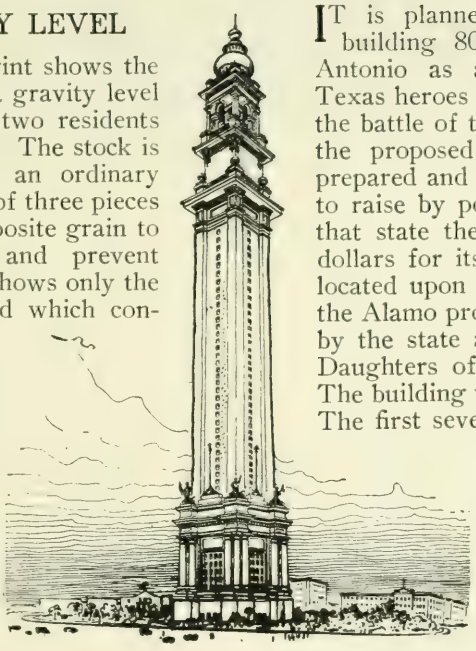
In the not far distant future the Oregon Trunk will be an important unit in a new steel highway between Portland and San Francisco. The proposed route already has been surveyed and is pronounced entirely feasible. At a point fifty miles south of Bend it attains a mean elevation of 4,500 feet. From that point the descent to tidewater at San Francisco is as gradual as it is to Portland on the north. Theoretically it would be possible to place a box car at this point and if started toward the south it would roll down hill all the way to San Francisco. If started northward it would roll down hill all the way to Portland. There are no intervening grades on either side.



New Style Gravity Level.

NEW GRAVITY LEVEL

THIS photo of a print shows the working part of a gravity level recently patented by two residents of Hayden, Colorado. The stock is about the length of an ordinary spirit level and made of three pieces of hardwood with opposite grain to render it accurate and prevent warping. The print shows only the center pieces of wood which contain the working parts of the level. There are no spirits or glass in this level, in fact nothing to get out of order. A small shaft is mounted on jewels or hardened steel—according to the price of the level—in such a manner that it has perfect and accurate swing. To one end of this shaft is attached a swinging bob or weight, to the other three indicator hands. The weight causes the shaft to act as a plumb, and although the shaft swings easily, the swinging weight on it breaks the movement and brings the shaft to a stop in an instant. The three indicating hands enable the instrument to be read from both sides and from above. It can be used as a plumb, in upright po sition, or for any angle and cannot be laid down upside down for it has command of the full sweep of 360 degrees. It can be used for finding the proper elevation for rafters, railroad tracks, irrigating ditches, etc., by noting the number of degrees with each test. This instrument can be placed on the market as cheaply as any spirit level of good quality, and it is claimed will surpass the best in accuracy, durability and the number of uses to which it may be put. It is a very valuable device and certainly should find a warm welcome.



Two-Million Dollar Tower to Be Erected in Memory of the Brave Men Who Fell at the Alamo.

TO REMEMBER THE ALAMO

IT is planned to erect a tower building 800 feet high in San Antonio as a monument to the Texas heroes who lost their lives in the battle of the Alamo. Plans for the proposed building have been prepared and steps have been taken to raise by popular subscription in that state the sum of two million dollars for its erection. It will be located upon grounds belonging to the Alamo property which is owned by the state and controlled by the Daughters of the Texas Republic. The building will be 65 stories high. The first seven stories will be used for office purposes. It will be eighty-five feet square at its base. Next to the Eiffel tower it will be the tallest structure in the world. It is a worthy monument to the brave men who fought for Texan liberty.

Young Hooded Seals.
They were brought from Greenland by Harry Whitney, and are said to be the first of their species to be exhibited in the United States. They are the only ones in captivity in the world.

THE TOY OF A MILLIONAIRE—THE UMBRELLA PLANE FLYER.

UMBRELLA PLANE FLYER

THE "umbrella plane" is the latest toy of Harold F. McCormick of Chicago, the son-in-law of John D. Rockefeller. He has spent ten thousand in experimenting with this machine. It has one plane only, and it is round, with a hole in the center large enough to hold the engine, the steering apparatus and the operator. The "umbrella plane" is entirely original in construction. It has been the butt of frequent ridicule of flyers and mechanics established at the field of the Aero Club of Illinois near Chicago. The machine made its first flight recently when this photograph was taken. It flew on the straightaway at a height of about twelve feet but was unable to negotiate curves owing to the peculiar nature of its structure.

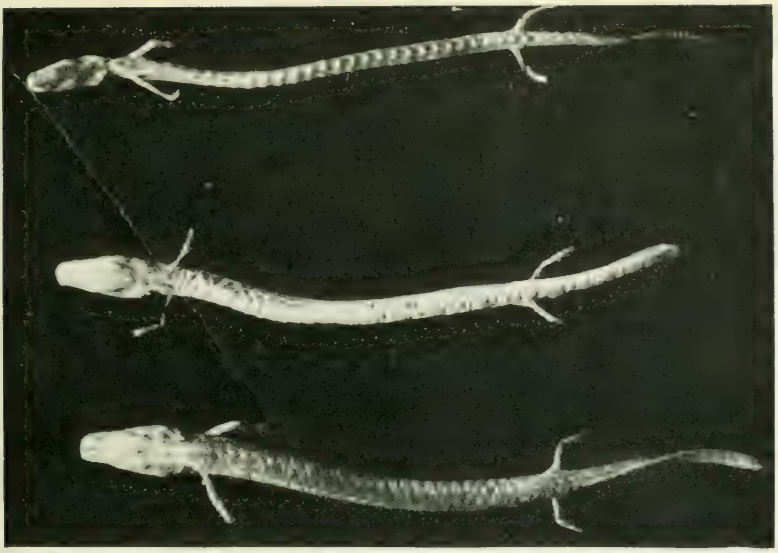
POSTMISTRESS AT EIGHTY

IN the same house where she was born eighty years ago lives the oldest postmistress in the country. Mrs. S. A. Smith has presided over the office at South Sandisfield, Mass., for twenty-seven years, and she has done the active work even longer, for her father had held the office since 1868. All this time it has been in the family home which was built at the very beginning of the last century, and is one of the landmarks of the countryside.

Mrs. Smith still does all the work of the office as well as her own housework without any assistance. Summer and winter she is up at five o'clock to have the mail sorted and ready for the Winstead stage which leaves at seven. A long life of hard work and early rising has left her with excellent health.

She has planned to give up the office from time to time, but South Sandisfield has objected so vigorously that she has kept it. Under her rule the big room has become a sort of club where civic affairs are discussed and settled. Mrs. Smith takes the keenest interest in her scattered community, whose members drive in with their teams for their shopping, their mail, and a little talk with the postmistress who is always ready with a little chat if not with a letter. She has always distributed optimism as well as mail, and so even the rural free delivery has not robbed her of her popularity.

A HALE AND HEARTY POSTMISTRESS OF EIGHTY.



THE EFFECT OF LACK OF FOOD.
The lizard at the top has fasted for three years.

LIZARD'S REMARKABLE CHANGES

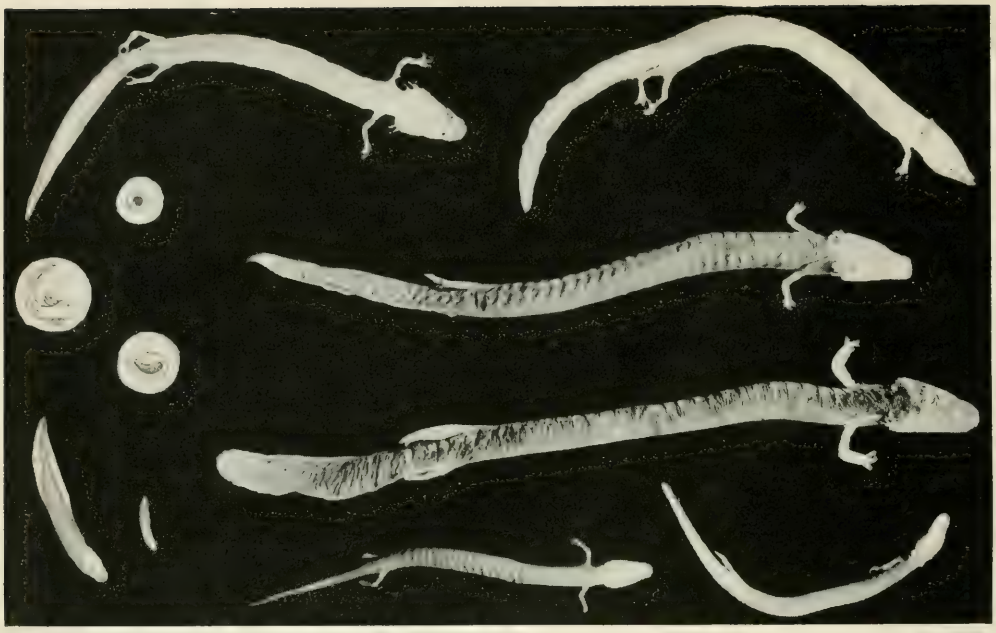
By

ALBERT GRANDE

PROTEUS, a snake-like amphibian, inhabiting the caverns of Dalmatia and Carniola, Austria, is doubtless one of the strangest creatures that ever puzzled the scientists.

Dr. Paul Kammerer, at the Biological Research Laboratory of Vienna, has made some curious experiments on this remarkable animal.

At temperatures below fifteen degrees centigrade, independently of any other factors, the female is found to bring forth its young alive, just as if it were a warm-blooded animal. Now as the water temperatures in the caverns of its native country never rise as high as fifteen degrees, this must be considered a normal process. At temperatures above fifteen degrees centigrade, however, proteus, irrespective of other factors such as light, age and food, is found to lay eggs, the same female performing this marvel according to circumstances. The embryos developing from these eggs are provided at the back with a fin, but do not seem to be able to remain alive. In so low a temperature as proteus ordinarily lives in it would be, of course, impossible to hatch out eggs. Nature, therefore, attempts to adjust herself to these changing conditions. This lizard has other peculiarities. For example, it is indebted for its flesh color only to the numerous blood vessels of the skin. Individuals submitted to prolonged fasting even assume a very pure white coloration. In broad day-light they will, however, develop brown or bluish-black pigments, which are the richer as the action of light is more intense, the water warmer and the animal younger and better fed. Male animals take a coloration more rapidly and completely than do the females. Red light is quite inefficacious. While this process is reversible,



THE EXTRAORDINARY LIZARD, PROTEUS, IN VARIOUS STAGES OF EVOLUTION.

decoloration is slower than coloration. The offspring of colored animals, even if born and developed in the dark—strange to say—is always colored.

The rudimentary eye of a new-born proteus rapidly develops and becomes differentiated in day-light. This eye is, by the way, quite susceptible of regeneration.

However, the most remarkable phenomenon for a vertebra is the retrograde growth of this lizard. When deprived of all food, this animal is capable of reducing the total length of its body by some centimeters, while maintaining all its proportions. This phenomenon takes place especially in the light and at higher temperature, while in the dark and at low temperatures this involution (then always accompanied by disproportions) is limited to differences of a few millimeters.

HOME-MADE MEADOWS

By

BENJAMIN BROOKS

PRACTICAL Jim Hill, lately retired from active service by the newspapers, but still on deck, nevertheless, is accredited with the opinion that if the farmers of the Northwest don't devise means to prevent their farms from washing away in the Missouri River they will have to pack up and follow them down to the Gulf of Mexico or wherever else the soil may have drifted to.

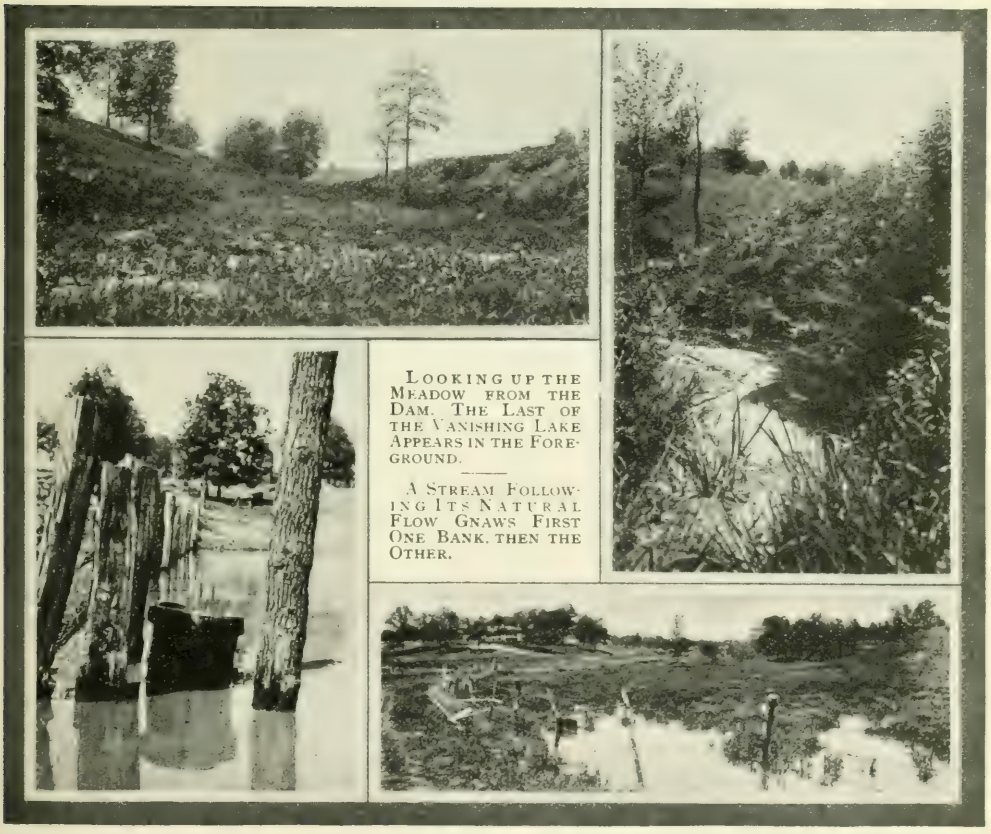
Many schemes have been discussed and even put into practice, but it fell upon one J. H. Christopher, millionaire farmer of Missouri, to come forward with a method of farm land conservation that he had demonstrated by fifteen years' practical application to be a success.

Mr. Christopher's farm, like many others in Missouri, used to comprise low rolling hills with rather steep depressions between. In each depression was a lot of waste land—the space grudgingly left for the stream to twist about in and eat away the banks as it flowed. The total of all the waste acres in these depressions was a bad enough factor in itself, but added to this was the fact that every time it rained hard on his newly plowed hills Christopher lost a certain percentage of soil from all his acres which ran off down stream and out of his territory. This caused Christopher to be much peeved. This peevement in turn caused him to think out a foolishly simple, highly practical way to keep his farm inside of his own fences.

This is his method of making two acres smile where one hole in the ground frowned before:

At the point where your good top soil, in the embrace of the muddy torrent, runs under your neighbor's fence and away from you, lay down about twenty feet of ordinary clay sewer pipe on the firm bed of the stream if it *is* firm, and on a foundation of logs or planks if it isn't. Cement up the joints and make a good job of it. Then over the pipe and across the stream scrape up an earth dam. On the upstream end of the pipe set an elbow pointing skyward and set on it one upstanding length of sewer pipe. Drive stakes around it to keep brush from clogging it and keep on building the dam until it rises, say two or three feet above the upstanding pipe. Then forget it till the first big rain comes.

When the rains come the stream takes, as usual, its tribute of top soil from the high points on the farm; but, being arrested by the dam, forms a pool and rises till it is able to pour down the overflow pipe. In the meantime, however, it has deposited the greater part of its soil in the pool. A few good rains will



LOOKING UP THE MEADOW FROM THE DAM. THE LAST OF THE VANISHING LAKE APPEARS IN THE FOREGROUND.

A STREAM FOLLOWING ITS NATURAL FLOW GNAWS FIRST ONE BANK, THEN THE OTHER.

THE PIPE AND THE DAM.

PROPERLY-CONTROLLED, THE STREAM DEPOSITS ITS GOOD SOIL.

suffice to fill the pool with mud. Then you scrape more earth on the dam and set a second joint of sewer pipe on the first and await developments. And so on till the waste ravine is all bush meadow with dairy cows on it.

No, there isn't any patent on this. Sewer pipe and mud dams have been too long in general use for that. What Christopher can do, any farmer with horse sense can do. He admits it himself. But be sure the pipe is big enough to carry all the water that comes to it. Get some local railroad man to give you his rule for culvert openings—and be sure the dam is always higher than the pipe and that the pipe is well set, well cemented and protected by stakes against stoppage by floating brush.

Follow the rules exactly and you will kill three birds with one stone. You will save the best surface soil on your farm; you will add tillable acres to it, and by carrying your roads along the tops of the dams you will build up their low places, ease your teams and cut down the cost of hauling to market.

Christopher talks of drain-tiling his home-made meadows some day so as to dry them off completely and make them firm to plough, but just now he is content to hold all the land that is his and turn all his holes in the ground into butter.

LAWS THAT NEED RECALLING

By

R. S. SOMERVILLE

A RECENT judgment handed down in Montreal established the ruling that the owner of a motor car is responsible for any damage caused by his machine whether it is taken out with his consent and knowledge or not. The case in point was an action for damages against Sir W. M. Aitken, now a British M. P., and formerly a young Montreal financier, by a man named Henri Rapin. The automobile of the defendant Aitken was taken out of the garage on an evening by F. Callaghan, Mr. Aitken's chauffeur. While being driven through the streets at a high rate of speed it struck the plaintiff, inflicting serious injuries. Rapin entered civil action against Aitken. Before the case came up for trial the defendant had gone to England to live. The charge was laid before Judge Archer and a jury, six being French and six English, on account of the different nationalities of the plaintiff and defendant, and a verdict of fifteen hundred dollars damages was returned.

The verdict raised a storm of protest and ridicule not only in Montreal but elsewhere, but the judge, one of the ablest on the local bench, could not have acted otherwise. The judgment was based on the following section of the provincial statutes concerning motor vehicles, No. 1406:

"The proprietor of a motor vehicle for which there has been issued a license according to the provisions of the present law must be held responsible for all infractions of that law or of any rules put into force in virtue of that law by the Lieutenant Governor-in-Council. He is also held responsible for all damages or accidents caused by his motor vehicle on a public road or thoroughfare."

It was in virtue of that enactment that every owner of an auto is liable for damages every time his chauffeur goes joy-riding or even should his car be stolen from a garage and run into trouble.

Another striking example of the peculiarities of Quebec law was provided in the Montreal courts recently in the case of the Prefontaine Estate versus Dame Morin. The decision rendered by Mr. Justice Davidson was to the effect that

if a landlady fails to pay her rent as it falls due, the proprietor has the right to seize all the furniture in the house, including the effects of the innocent boarder who may have been punctual in paying his dues to his boarding mistress. The court held that even though the boarder or lodger had paid up all moneys owing the landlady, he could not invoke the privileges of a sub-tenant, to claim that his effects were immune from seizure by the proprietor.

However, the boarder has a means to escape such a seizure, but the trouble is he never hears about it until by sad experience or else he objects to paying the notary's fee involved. Notaries are thicker than flies in Montreal and they all wax fat. The immunity consists in presenting a special legal notice to the proprietor of the domicile where you intend to board that you possess certain chattels and that these must not be considered as constituting security for any rent payable by the boarding-house keeper.

Sir W. M. Aitken, Who Found Himself the Victim of a Curious Canadian Law.

A few years ago a woman, who was just recovering from a long illness, was walking along Commissioners Street in Montreal, one fine Sunday afternoon when she was seized with a weak turn. A man passing by went to her assistance and gave her a mouthful of beer out of a bottle he was carrying in his pocket. A policeman happened along and arrested them both. In the recorder's court next morning, the woman's husband had to pay a fine of five dollars for his wife who was held to have violated the law by drinking out of a bottle on a public street.

A judgment somewhat similar to that of the unfortunate boarder was of that delivered by Mr. Justice St. Pierre on April 30 last. It shows another angle of the law relating to proprietors and tenants and is equally worth consideration as a curiosity. According to the Quebec law, a tenant who finds his house insufficiently heated by the landlord in cases where the latter is obliged, by the terms of the lease, to look after the heating, has no right to pack up his furniture and remove to another house. The proper course for him to pursue is to notify the proprietor by notarial protest to the effect that unless the conditions complained of are remedied, he will seek recourse in law to have the lease broken. Meantime, the wretched tenant continues to suffer while the slow machinery of the law is cranked up for the occasion.

DIRECTING A FOUL STREAM IN THE HEART OF BALTIMORE INTO A SEWER.

MILLIONS FOR HEALTH AND SAFETY

By

DR. LEONARD K. HIRSHBERG

WHEN the great pumps of the high-pressure pipeline went into service not long ago in Baltimore, the entire business section of the city was protected from fire by a high wall of water. This wall or curtain surrounds each square in the entire district.

During every minute of the day and night a pressure of one hundred fifty pounds is maintained. This is sufficient to throw a stream of water over a pretty high building. In case of need this pressure can be raised to eight hundred pounds, but this will seldom be used, as it is next to impossible for firemen to control water under such pressure. The piping of the system is guaranteed to withstand a pressure of twenty-five hundred pounds, and has been tested by the Fire Department up to one thousand pounds. This means that the pipes will not burst at critical times. The Philadelphia system, for instance, secures a pressure of but between three hundred fifty and four hundred pounds.

The system is capable of throwing ten thousand gallons of water a minute at this pressure. In case of need for

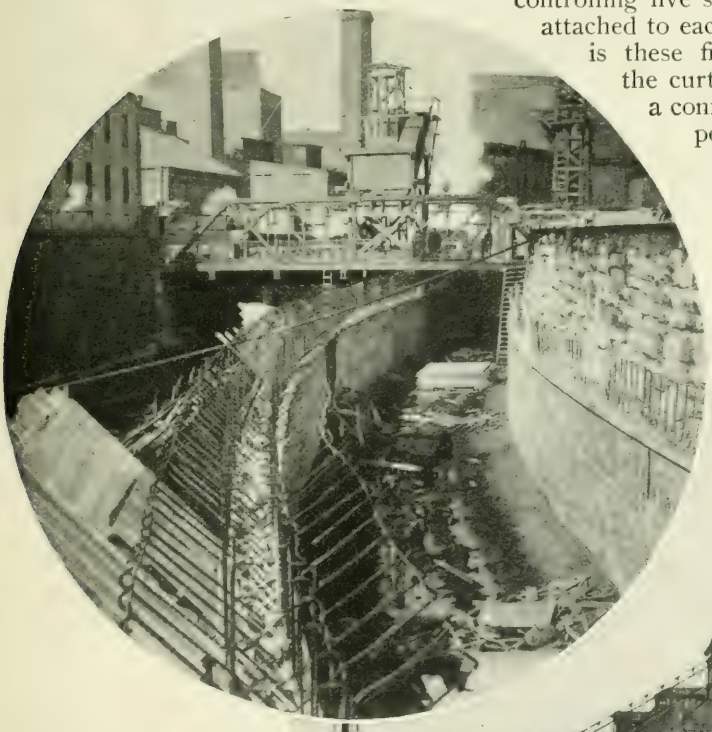
more water two fire-boats can be used as auxiliary pumps from the inlet at the foot of South Street, increasing the capacity by 13,500 gallons a minute, or making a total of 23,500 gallons a minute. This is equivalent to the amount of water thrown by twenty-five fire engines.

The system will be kept in constant service. Three pumps — two of four thousand gallons capacity per minute and one of fifteen thousands gallons capacity —make up the pumping force. Three big boilers furnish the steam. Two are kept going day and night. The third is held in reserve. Arrangements have been made to secure steam from the power house of the street railways and electric lighting company as another reserve supply in case of emergency.

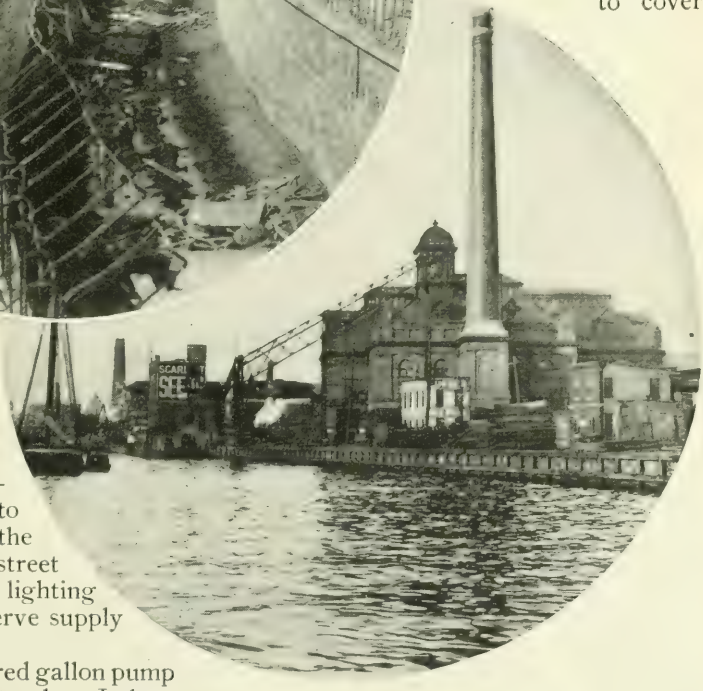
The small fifteen hundred gallon pump is kept in service constantly. It keeps the pressure in the pipe line at one hundred fifty pounds. As soon as the demand for water in case of fire causes the pressure to fall below one hundred fifty pounds, the first of the large pumps will automatically go into service. The plans call for the installation of a third of these large pumps. At any time great pressure can be secured by a telephone message to the power house. The fire boats will be used whenever necessary.

There are two hundred and fourteen hydrants along the system. The number varies from two to three to a block, according to conditions. Special fixtures, controlling five streams of water, can be attached to each of these hydrants. It is these fixtures that will direct the curtain of water in case of a conflagration. Had the city possessed such a system in the great fire eight years ago today, a different story might have been told.

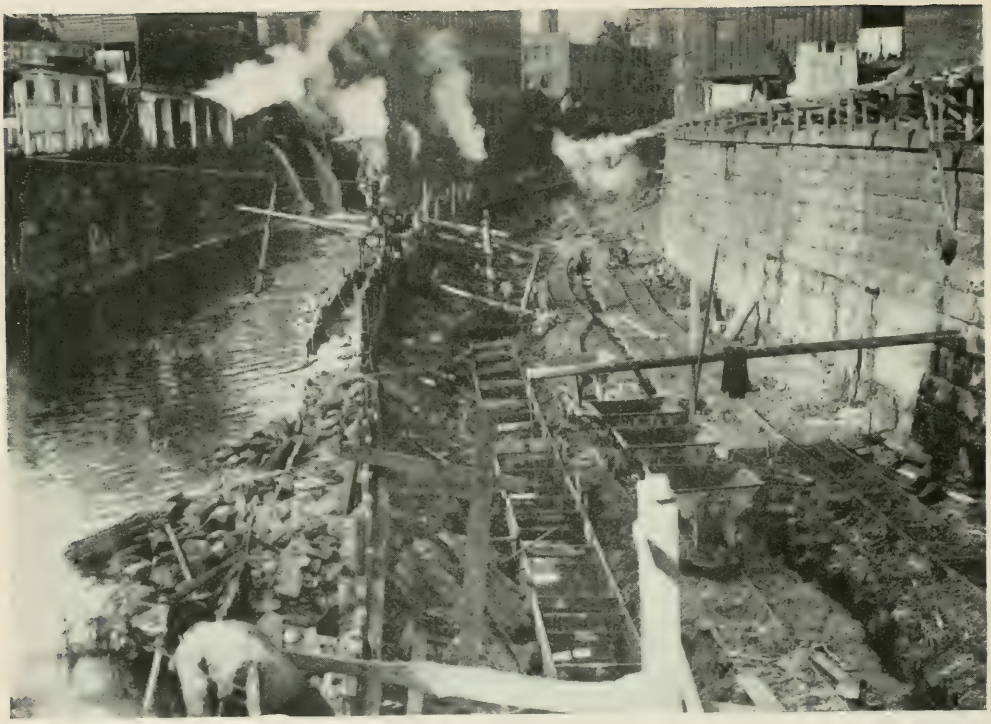
The district covered by the pipe line is irregular. The old fire board in planning it, tried to cover



PUTTING THE ILL-SMELLING JONES' FALLS INTO A STRAIGHT JACKET.



A SECTION OF THE PUMPING STATION AT THE END OF JONES' FALLS.
Baltimore will have a remarkable sewerage system.



FILLING IN JONES' FALLS.
Temporary tracks and cars in fall's bed for carrying concrete.

the important manufacturing and business section.

In addition to protecting itself against fire, Baltimore is also determined to conserve its health.

Jones' Falls, an odoriferous, sluggish, foul, ugly canal of water winding its corrupt course through the very heart of Baltimore, as the Seine flows through Paris, will soon be a thing of the past. The oldest inhabitant of Baltimore denies that it ever deserved the name of Jones, and certainly there has never been a trace of any water fall along its muddy bed.

Draining, as it does, a populous area of nearly sixty square miles, it is easily realized that the flow occasionally rises in volume to as much as thirty-five hundred cubic yards per second. Zigzagging its polluted waters between the architectural canyon of granite walls, brick buildings, and plastered boundaries, Jones' Falls has remained a constant source of unpleasant odors, dangerous floods, and other possible disaster to Baltimore.

But no more! Baltimore, the home of the Johns Hopkins University, is at last alive to the necessity of converting its surface drainage and open sewage-way into the covered sewers with the greatest of modern disposal plants.

Twenty-one million dollars has been borrowed by the citizens of Baltimore to make old Jones' Falls a beautiful covered parkway, and to establish the greatest system of modern sewers ever dreamed of by engineers.

The two essential factors that make the building of the Jones' Falls Boulevard of more than ordinary interest are, that the construction is being done right in the bed of the falls with no reduction in the stream's flow, amidst heavy rains which make possible the water's rising above the concrete conduits and covering the cofferdams; and the constricted space in which the work is being done and the material manipulated.

BIRD WITH A BIG HEAD

SKULL OF HUGE BIRD THAT FLOURISHED HUNDREDS OF THOUSANDS OF YEARS AGO.

UNDENIABLY "there were giants in those days." It may be that the "phororhacos" did not weigh quite as much as the now extinct Moa of New Zealand (whose avoirdupois was largely in its huge and clumsy legs); and it was no taller than the giant ostrich of Madagascar, which measured ten feet in height. But it had by all odds the biggest head that any bird ever possessed.

One may judge of this from the accompanying photograph of a skull of the remarkable fowl in question, which flourished in Patagonia some hundreds of thousands of years ago. In all likelihood it would have tipped the scales at not less than half a ton.

ELECTRIC LOCOMOTIVE TO SHOW WHAT IT CAN DO

ONE of the severest grades traveled by any locomotive in the United States is on the Denver and Rio Grande Railroad at the crossing of Soldier's Summit, in the Wasatch Mountains, about one hundred and twenty miles southeast of Salt Lake City. The grade is over four per cent and, as the photo shows, the ordinary passenger trains are hauled by five of heaviest type of Mallet engines.

At the commencement of the year, plans were formulated to side-step this grade, and by a tremendous amount of cutting and excavating to construct a track around the summit instead of across it. But the electric locomotive has come into the project and changed those plans. Within easy distance are several mountain torrents; and the new purpose of the company is to build power plants on one or more of those streams and use the electric current for electric locomotives on the old track.

The general traffic manager of the road, in a recent interview said:

"If we find that the electrification of our line is feasible on the most difficult stretch of track we have, it is quite probable that we shall install similar service on the other mountain passes. This

HAULING A PASSENGER TRAIN WITH FIVE STEAM LOCOMOTIVES.

UNCLE SAM'S LITTLE BROWN-LEGGED SOLDIERS.

would be particularly economical, as it would obviate the necessity of a large amount of double tracking, for the tests to which electric locomotives have been put in the last few years indicate that they can handle traffic faster, better and cheaper than by the use of steam engines.

"It is merely a matter of comparison of the cost and efficiency, and if we find that we can do better with electricity we shall use it. The manufacturers of electric locomotives assure us that they can build them of high enough power for any mountain work, and it remains for them to prove their assertions."

BARE-LEGGED SOLDIERS

UNCLE SAM has in his army some thousands of little brown men of the mid-Pacific who approximate all grades of civilization and a lack of it and who are well typified by the accompanying illustration which shows the Philippine soldier in the course of being transformed. A year before this picture was taken these men were wild in the woods with nothing but a breechclout to hide their nakedness. They have advanced to a stage where they take great pride in their caps and coats but still refuse to adopt the trousers and shoes. A year later, however, they will be found as fully accoutremented as is their captain shown in the foreground.

DOG AS A POLICE AID IN NEW YORK CITY.

The Philippine constabulary of which these men are a part, is now a little more than 5,000 strong, including officers and men. To be exact there were 5,130 men and 296 officers at last report. This constabulary had its origin in the Filipino Scouts that were organized during the war of occupation.

The Filipino boys are taken when they know nothing of civilized life. There is a scramble to get into the service.

DOGS FOR POLICE WORK

DOGS have proved very serviceable in Paris and other European cities for the capture of criminals. One way in which they help is by so seriously engaging the attention of a thief or other offender against the law as to prevent him from making his escape or from putting up an effective fight.

Recently the idea has been adopted in New York City, and in the picture on the opposite page we see a dog of the metropolitan police in the act of escorting a "cop" on his round of duty.

MOTOR CAR FOR FUNERAL PARTY

IN Chicago most of the cemeteries are from nine to eighteen miles from the business center, and often as far from the homes of the people who have to bury their dead. The transportation of a funeral with thirty mourners and the body in the usual horse-drawn vehicles to any of the cemeteries within twelve miles of the downtown district costs sixty-six dollars and upwards. This does not represent all the expense, for a stop is usually made at a road house to feed the horses.

The car illustrated here is intended to be used for funeral purposes. It is about twenty feet long and seven feet wide. The casket compartment in front is 7½ feet by three feet, two inches square. The car will carry twenty-eight passengers. The casket compartment is to be lined with sheet copper and the flower compartment enclosed with glass so that it will be separate from the other portion of the coach. There are four doors on the left side of the car and three on the right side. The coach is to be driven by electricity.

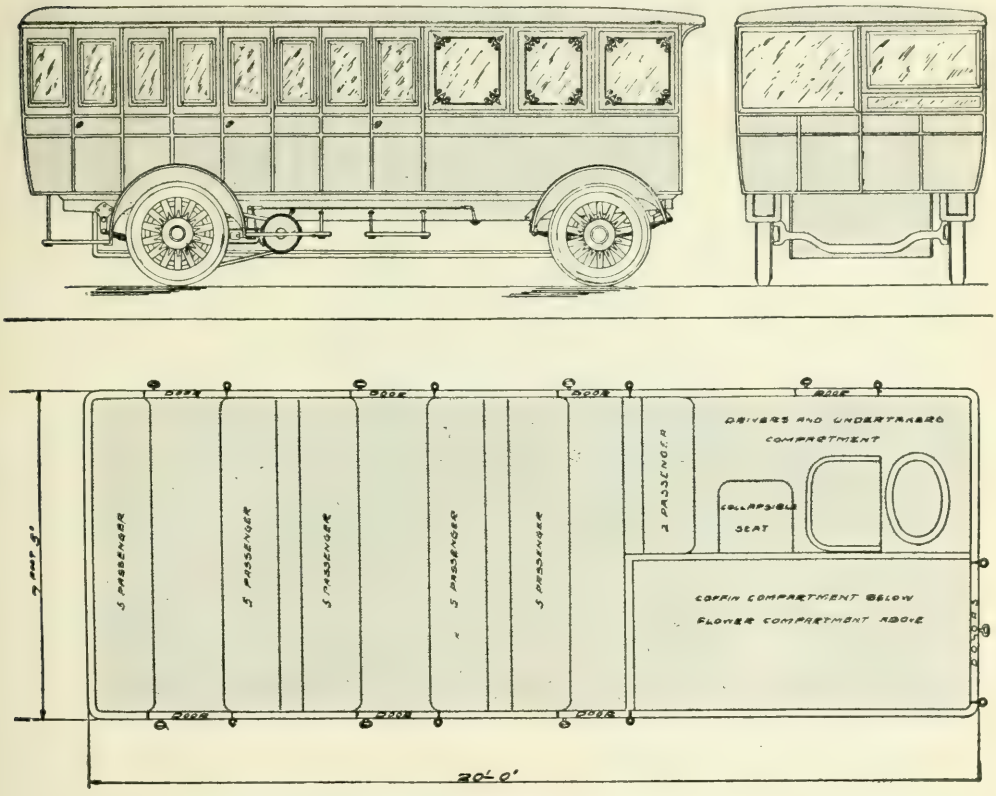
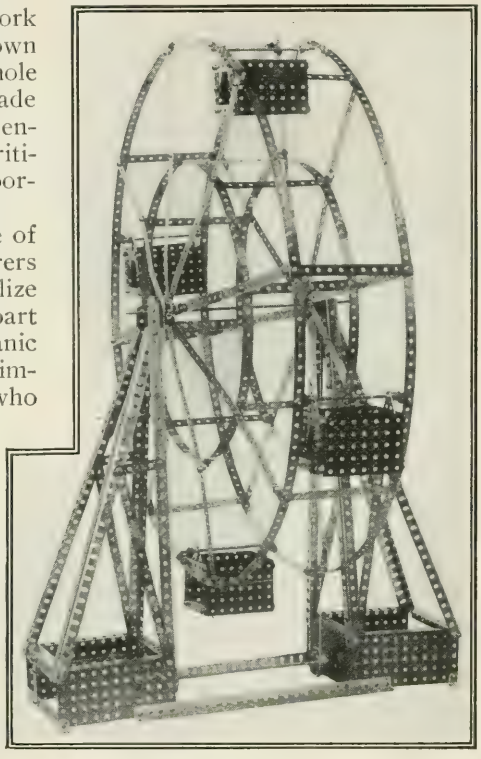


DIAGRAM OF FUNERAL CAR SHOWING SIDE, END AND INTERIOR VIEW PLAN.

DEVELOPING THE FUTURE ENGINEER

THE boy with a real mechanical turn of mind is seldom satisfied with store toys. He would a hundred times rather take hammer and nails with what odds and ends he can find in the woodshed and work out some idea of his own than to possess a whole houseful of ready-made locomotives and fire engines which to his critical eye lack many important details.

Until recently none of the toy manufacturers have seemed to realize this desire on the part of the young mechanic to build something himself, but one man who perhaps remembers some of his boyish impulses has developed an idea possessing all the marks of a winner with the embryo engineer. He has undertaken to furnish outfits of mechanical parts from which may be built anything from a toy wagon to a miniature Ferris Wheel. These outfits consist of strips of light metal varying in length and having holes punched at equal distances from end to end. By means of small screws and nuts the various parts are put together in almost numberless ways and structures surprisingly real in appearance can be produced by an ingenious boy in a very short length of time.



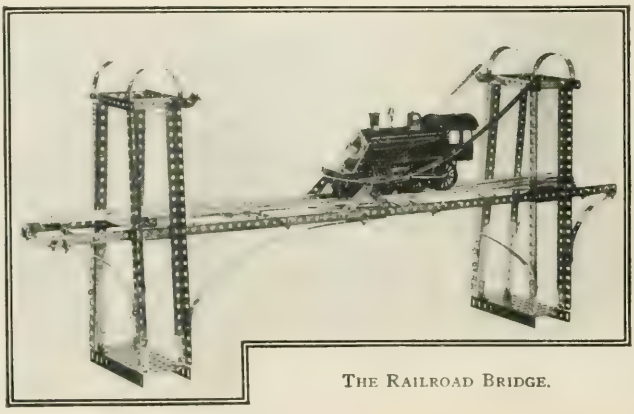
THE MINIATURE FERRIS WHEEL.

Beside the structural material described there are also grooved pulleys and gears of great variety so that almost any modern work of engineering can be reproduced in miniature.

The various metal strips are formed in imitation of structural steel beams and the young engineer readily acquires a knowledge of the strength of materials and elementary engineering practice which many weeks of study would fail to impress upon his mind. He also becomes familiar with the form of many of the well-known works of engineering and acquires a knowledge of the subject which cannot fail to be of great value to him in later years even though he may not follow the engineering profession.

Each piece of the material is nicely finished with smooth edges and rounded corners and nearly all the parts are nickel-plated. Everything is furnished with the outfit which the boy would require even to a quantity of good stout string, for even this is not always obtainable in the home.

Complete instructions are furnished.



THE RAILROAD BRIDGE.

THE FOREST PRODUCTS LABORATORY, IN CONNECTION WITH THE UNIVERSITY OF WISCONSIN, AT MADISON, WHERE METHODS OF ELIMINATING TIMBER WASTE ARE STUDIED.

TO STOP THE WASTE OF FOREST PRODUCTS

By

ROBERT H. MOULTON

NOT long ago the superintendent of a big railroad was on a tour of inspection of his company's lines. Sitting on the observation platform of his private car, he watched a crew of track repairers who were replacing worn and splintered ties with new ones. Suddenly his attention was attracted by a call of the foreman in charge to "leave that tie in; it's all right."

The superintendent walked over to get a look at the tie in question. He found, as the foreman had said, that it was all right—the only tie in a long line that did not show the effects of time and wear.

"I suppose," said the superintendent to the foreman, "that that tie was put in recently, wasn't it?"

The foreman shook his head. "This is the first time we have repaired this section in five years."

"Then why has it outlasted the others so long?" asked the superintendent.

The foreman looked puzzled, scratched his head, and confessed that he didn't know.

The superintendent examined the tie carefully. It was undoubtedly of the same wood as the others, but—and then he made a discovery. The tie appeared to be stained with some sort of dark liquid, and bending down to see what this might be his nose caught a whiff which told him that it was creosote. In some accidental manner the tie had been subjected to an infusion of this substance.

Immediately the superintendent began to do some thinking. If one tie could be made to outlast its fellows so long after such a treatment, why wouldn't it be a good idea to treat them all? The cost would not be great, and the saving—here he did some rapid figuring with the result that he discovered that if the life of all the ties on his company's lines could be increased to the same extent as the one he had seen it would mean an annual saving of nearly a quarter of a million dollars.

Then calculating roughly he found that a similar saving on all of the railroads of the United States would reach the enormous total of $15,000,000 each

TELEPHONE POLE BADLY DECAYED AT THE GROUND LINE.

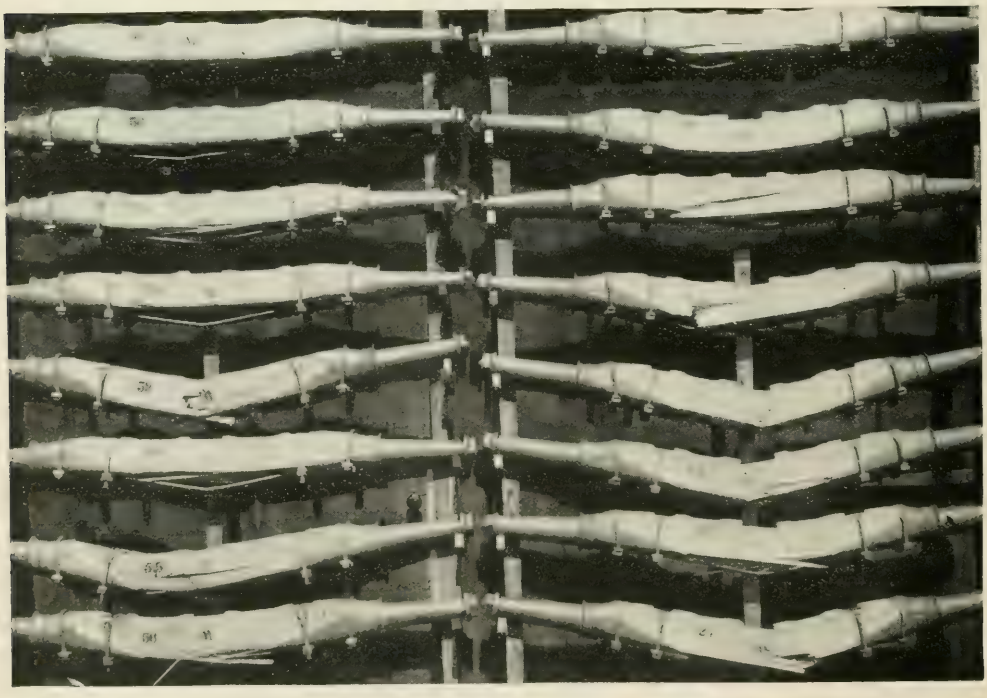
year. In other words, this was the amount lost annually by the railroads of this country because they either did not know that the life of a tie could be prolonged by means of a preservative or were ignorant of the proper kind that should be used on it.

Also, there were the telegraph and telephone poles, and the fence posts along the right of way of the railroads, to say nothing of the countless others scattered all over the country. By this time the superintendent's brain was struggling with a maze of figures that reached up into the hundreds of million dollars, so he gave up the mathematical problem, merely resolving to recommend to his road that all new ties along its route should first be treated to a preservative.

It was with the idea of conducting experiments which would tend to eliminate just such waste as the above, besides many others connected with our forest products, that there was established a little more than a year ago the United States Forest Products laboratory. The laboratory, the only one of its kind in the world, is located at Madison, Wisconsin, and is run in co-operation with the University of Wisconsin. The University furnishes the buildings, the light, heat, water and power required for operation, and in return the Forest Service offers lectures on forestry at the University, and allows the students and faculty the use of its laboratory.

CREOSOTED FENCE POST SHOWING NO SIGN OF DECAY AFTER TWENTY-THREE YEARS' SERVICE.

The laboratory is under the direction of Mr. McGarvey Cline, and in addition



WAGON AXLES THAT HAVE BEEN TESTED FOR STRENGTH.

LAYING AN EXPERIMENTAL TRACK.
About 1,600 ties were treated at the Forest Products Laboratory. A number of different preservatives and processes were used. These ties were recently placed in the main line of a railroad near Hartford, Wisconsin, to test their durability.

to two assistants, who aid Mr. Cline in passing upon all the plans and projects undertaken by the laboratory, there are over fifty employes, the majority of whom are men who have had technical training in the professions of forestry, engineering, and chemistry. The various departments of the laboratory are housed in a fifty-thousand dollar building, and there is a nearby lumber yard and sawmill where are made

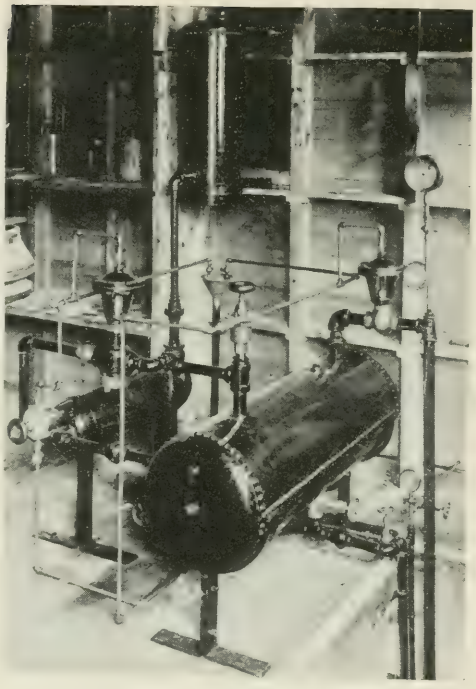
CROSS SECTION OF RED OAK TIE TREATED WITH CREOSOTE.
The preservative has penetrated the wood thoroughly.

MCGARVEY CLINE.
The director of the Forest Products Laboratory at Madison, Wisconsin.

CROSS SECTION OF MAPLE TIE, INTO THE GRAIN OF WHICH THE CREOSOTE WAS UNABLE TO WORK COMPLETELY.

the specimens required for experiments.

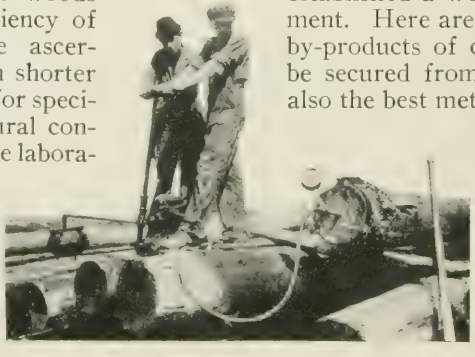
One of the most important departments of the laboratory is that devoted to wood preservation. Experiments are being made with various substances, which, when infused into wood, tend to retard decay and ward off the attacks of insects and salt-water borers. It is estimated that every year decay, fire, insects, and salt water borers destroy the equivalent of eight billion board feet, the most of which can be prevented by the preservative treatment. This treatment would mean, in the increased life given to the timbers, an annual saving in wood equivalent to four billion board feet, or ten per cent of the yearly lumber cut.



SPRAY REGULATING APPARATUS FOR EXPERIMENTAL DRY KILN.

This dry kiln employs an original method of regulating the humidity. Water spray condensers are placed in narrow chambers on the sides of the kiln; by regulating the temperature of the water, the humidity is controlled.

In conducting its experiments with preservatives the laboratory makes use of a fungus pit. The temperature and moisture are regulated automatically and the conditions maintained are those most favorable to fungus growth. In the chambers of this pit the comparative durability of woods and comparative efficiency of preservatives can be ascertained in a very much shorter time than is required for specimens exposed to natural conditions in the open. The laboratory recently treated several thousand railroad ties, using a number of different preservatives and processes, and placed them in the main line of one of the big railroads that cross Wisconsin for testing their durability. These are inspected from time to time and records kept as to the efficiency of the different processes used. In the same way experiments are being made with telephone poles, materials for block pavements, fence posts, and piling.



IMPREGNATING LOGS WITH WOOD PRESERVATIVES.

A very important work being done by the department of chemistry is the classifying of the different kinds of creosote obtained from tars, as to their chemical and physical properties. The most of the higher grades of preserving oils used in this country are now imported from Europe. The reason for this is that the tar-paper industry of the United States consumes nearly all of the coal-tar by-products, of which creosote is one.

Realizing the opportunity that exists for saving in the utilization of the by-products of our lumbering industries, such as alcohol, turpentine, acetates, and wood creosote, the laboratory early established a wood distillation department. Here are studied not only what by-products of commercial value may be secured from different woods, but also the best methods of refining them, and the design of machinery best adapted to their production.

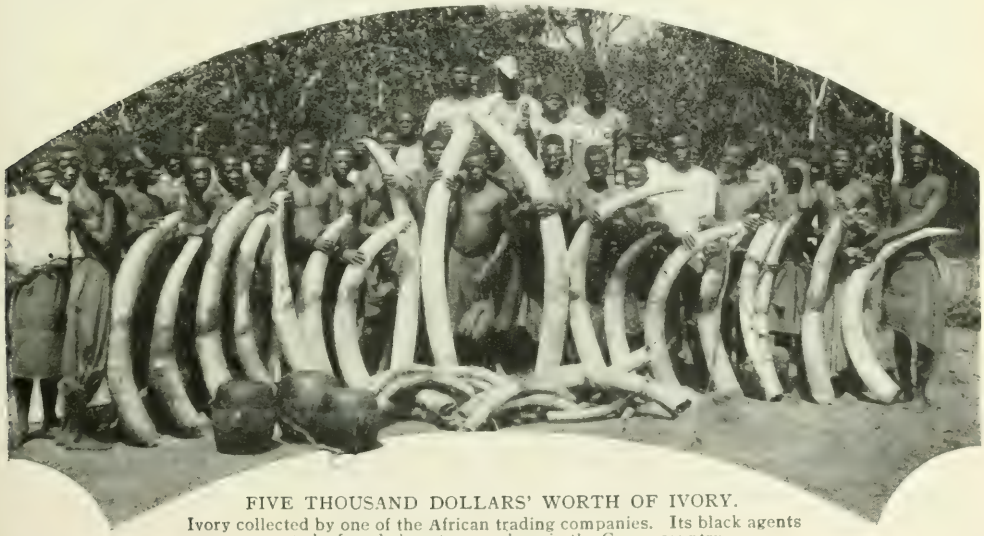
In addition to this, the department is looking for wood substitutes for various woods in common use.

FORCING FOOD DOWN THE THROAT OF THE REGAL PYTHON, WHICH WAS ON THE VERGE OF VOLUNTARY STARVATION, AT THE NEW YORK ZOO.
Two rabbits on the end of a pole were rammed into the reptile's interior.

WIRELESS ANTENNAE TO DISAPPEAR

THE unfortunate fall of the great "wireless" antennæ tower at Nauen in Germany lends special interest to the recent experiments of the Imperial telegraph service in Berlin, tending to attain a greater radius of action of wireless apparatus, without the use of these high towers or their equivalent.

The erection of these sky-piercing structures is based on Marconi's discovery that the higher the electric rays or streams above the earth's surface the greater the effective radius of action. But recent experiments in Berlin are based on an entirely new theory, advanced by Prof. Ludwig Zehnter of the Technical High School in the German capital. In the experiments of Zehnter, instead of the antennæ system there are used only suitable horizontal insulated wire conductors of suitable dimensions lying near the ground, stretched between poles and led off to the earth; Leyden jars being introduced in the system. With such simple conductors it has al-



FIVE THOUSAND DOLLARS' WORTH OF IVORY.
Ivory collected by one of the African trading companies. Its black agents are to be found almost everywhere in the Congo country.

FUNERAL TRAIN OF LEN SCOTT, A CONSTABLE WHO WAS KILLED IN A SIX-SHOOTER FIGHT WITH A MEXICAN DEPUTY SHERIFF.
The Mexican also died. The funeral train is starting out from the "Town of No Streets."

ready been possible, with the use of comparatively small sending apparatus, to send signals to stations several hundred miles distant; and to receive them from across the Atlantic—for instance, from Glacé Bay in Canada to the wireless station near Berlin—a distance that extends into the thousands of miles, certainly a proof of the new system's power.

THE TOWN OF NO STREETS

THE town of Morenci, Arizona, has not one street, only steep trails over the rock and mountains. There are no autos nor rigs of any sort. Stout ponies, mules and burros pack all loads while funerals must be attended by train as shown in the photo.

This is perhaps the only town in the United States without a street of any kind or a conveyance of some sort.

GROWING TREE SPLITS ROCK

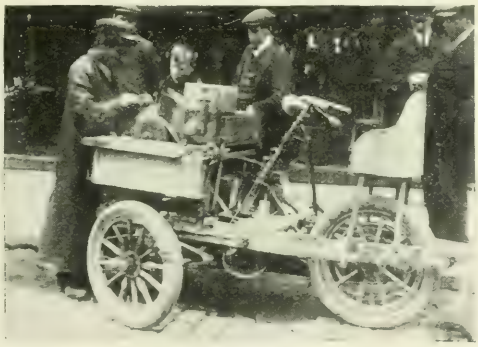
IT is sometimes a cause of wonderment as to the way in which the roots of trees and plants can penetrate hard, stiff, soil. How much more remarkable then is it to see trees not only grow in an almost solid rock region where there is scarcely a pinch of soil, and that only coarse-grained particles from the rocks themselves, but to see them thrive and attain such size and strength that their roots can actually split great rocks wide apart. The photograph shows the lower part of the trunk and the root of an upland juniper on a mountain side in the Sierra Nevada of California, which is splitting a great granite boulder off the side of the hill. It is in this way that plant life effects, during the course of the years, great changes in the surface of the country.

NATURE'S FIGHT AGAINST TREMENDOUS ODDS.
A tree, determined to grow, splits a rock.

REAR VIEW OF THE HEADGATES OF THE SAN BENITO CANAL, SHOWING THE WATER ENTERING BY THE GRAVITY SYSTEM FROM THE RIO GRANDE.

LARGE GRAVITY IRRIGATION SYSTEM

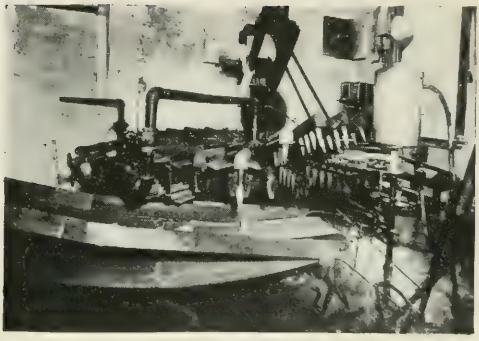
ONE of the common methods of irrigation by means of gravity flows is to construct a dam to bring the water up to the level necessary to convey it over the land through canals and ditches. In the lower Rio Grande Valley of Texas, however, there is one irrigation system that supplies water for more than thirty thousand acres of land direct from that river and without conveying it any distance in order to obtain a fall to get it over the property. This unique gravity canal system also utilizes a number of large resacas for water storage purposes. The direct irrigation of the land by natural flow of the water from the river is made possible by the fact that the Rio Grande for more than one hundred miles of its lower course flows at a height of several hundred feet above the adjacent valley which stretches away on the American and Mexico sides for distances ranging from five to fifty miles. Concrete headgates were built at a point on the river a few miles south of the town of San Benito, and through this intake the main canal receives its supply of water from the stream. It is only during a few weeks of the dry season each year that the water level of the Rio Grande gets too low to flow into the canal. In order to provide a supply during this period an auxiliary pumping plant was installed adjoining the intake and it is used when necessary.



ENGINE WHICH DRIVES THE GRINDSTONE AS WELL AS THE AUTO.

AUTO AND SCISSORS GRINDER COMBINED

THE Yankee is given credit as being one of the shrewdest and most ingenious inventors in the world. The



ELECTRICALLY DRIVEN MACHINE THAT AUTOMATICALLY MOLDS CONES AND DELIVERS THEM BAKED.

French, however, could give even a Connecticut Yankee a close run if their wits were to be brought into contact against each other. This automobile device, shown in the illustration on page 55, is proof for this statement. Here we have a three-wheeled automobile, which also has incorporated with its parts a grindstone. The owner of this novel combination of vehicle and grinding machine hit upon this plan as a means of increasing his income. Carrying his grinding apparatus about upon his back or pushing it on ahead, is not only very fatiguing, but the distance that can thus be covered in a day is measured by the number of steps he can take. But with this device he can travel from one good business district rapidly to another, get out, and without stopping his motor —which turns the grindstone — can quickly sharpen knife or scissors.

OUT FOR AN "AUTO" TRIP ALONG THE RAILROAD TRACKS.

ELECTRIC AUTOMATIC CONE BAKING MACHINE

AN automatic cone baking machine has been designed and constructed at Seattle, Washington. It is built in the shape of wheels, having twenty-eight arms. Each arm has five baking molds and it takes about one minute for the wheel to make one revolution. The machine has a capacity of about 50,000 perfect cones in ten hours.

A one-horsepower electric motor is used to run it and for baking the cones the machine consumes about eight hundred cubic feet of gas per hour. It is fed automatically, the molds going under the feeder closed and continue to revolve until near the point of starting when they open and the cones drop on a belt and are carried to a table where they are packed.

Although the machine looks complicated it is very simple and a girl can operate it without difficulty. The heat is regulated by a series of valves handy to the operator. It weighs about two tons and measures about seven feet in diameter.

AUTOMOBILE BUILT BY BOYS

THE photograph shows the rather curious invention of a number of clever school boys of Los Angeles, California. It is a very rough and ready sort of automobile built for the purpose of enabling them to make long excursions along the railroad tracks on holidays and in the glorious days of summer vacation. The fuel used is benzine. The container for this liquid was once an old syrup box. The transmission of power from the engine to the wheels is made possible by means of an old leather strap which connects the engine to the rear axle. Equally simple and ingenious are the other essential parts of this vehicle. One might think it a rather dangerous pastime for boys to engage in, owing to the hazards of meeting with trains, but it is presumed that youngsters so skilful as this would learn from time tables and otherwise the movements of all trains that were likely to travel over the particular piece of road they might care to use at any particular time.

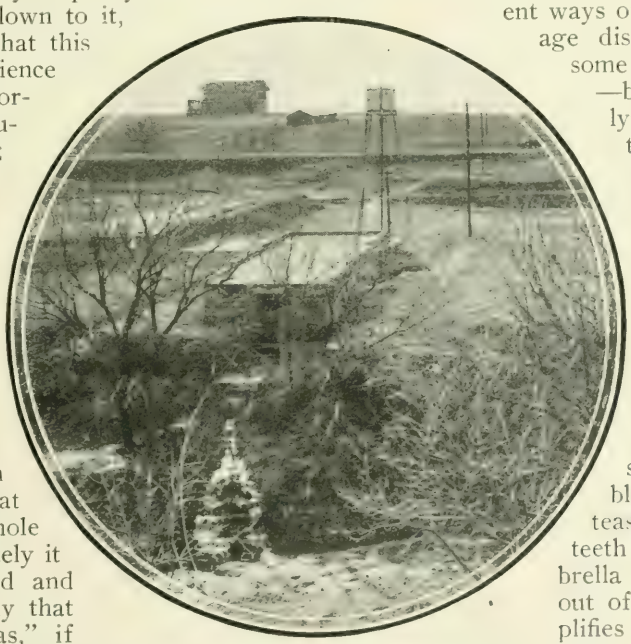
ELECTROCUTING NOXIOUS NEIGHBORS

By BENJAMIN BROOKS

ANY fair, open-minded chemist will admit to you that H_2S is simply a scientific, polite or honorary title for a very bad smell. If you open a venerable storage egg in his presence he will simply note the "evolution of H_2S," but you will more forcibly express yourself to the head waiter. If you meet him at the street corner on a nice warm summer day—one of those corners directly over the opening to some strong, husky, more-than-ripe sewer, he will remark, after a few appreciative sniffs, "Ah! remarkable septic action here; fine evolution of H_2S," but you will be for running to the telephone and arguing with the city inspector.

If, however, you pin your chemist right down to it, he will admit that this clothed-in-science H_2S is a thoroughly disreputable character; that, if closely associated with even as much as eight hundred parts of respectable fresh air and breathed for an appreciable time, it will kill a man—and, for that matter, his whole family. But lately it has been found and proved not only that this "sewer gas," if properly conserved through leaky traps in unventilated apartments, will kill people, but that it will destroy property. I mention this last criminal particular because all really profound investigators observe that many communities, apparently indifferent to the lives of their individuals, get noticeably peeved when their property is menaced; and I wish to forestall any ridiculous sentimentality that may be induced through prejudice against capital punishment as indicated by the heading of this article.

The particular field of destruction to which H_2S devotes its attention is sewers and sewage disposal tanks for which, in their enthusiasm for health and sanitation, people are nowadays spending much good money.

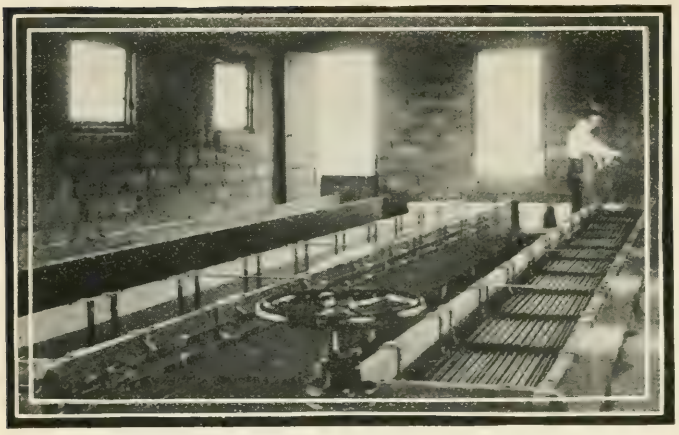


SEWAGE DISPOSAL PLANT AT OKLAHOMA CITY. ELECTRICITY ACTING ON IRON PLATES CREATES IRON SALT. THIS SALT LEADS SEWAGE GAS SUMMARILY TO EXECUTION.

There are seven dozen different ways of building sewage disposal plants—some of them right—but the underlying principle in the majority of them seems to be this:

First you run the discharge from the main sewer into a quiet tank or lake to allow the sand, hairpins, buttons, safety razor blades, tin cans, teaspoons, false teeth and old umbrella frames to settle out of it. This simplifies the steps that follow.

In the next step we invoke the indispen-



The Interior of the Sewage Disposal Plant.

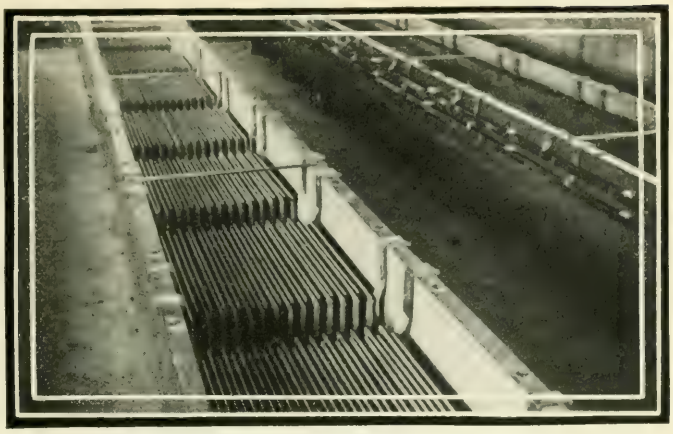
sable services of bacteria—thousands of billions of armies of them. The idea is that all the contents of a sewer were at one time simple, inoffensive things such as the earth is made of; but that plants and animals (among which are included, for scientific purposes, human beings) have rearranged them into "organic compounds" and discarded them in a perfectly useless mixup. Now, in order to bring them back again to original healthy, earthy elements so they can be re-used and re-absorbed or re-eaten, this horde of bacteria is absolutely indispensable to sort things out again, and the world would come to an end without them. So, the next step is to run the sewage into another series of tanks or lakes especially provided with all the modern conveniences for germ life—nice, dark, quiet labyrinths filled with community dwellings of broken stone, or with modern ten-story tenements formed of alternate layers of brick bats and slate slabs, so that all the bacteria have to do is to sit on their front door steps, take what passes by in the slow moving liquid and sort it according to taste. A lot of their sorting results in just plain, inactive, harmless clean mud. That settles to the bottom; but there are a lot of gases, too. They produce gas that you could light with a match (if you were so unwise), gas that would—and sometimes does—run an engine; harmless, odorless nitrogen gas; but among the lot of useful, harmless products is bound to appear our most undesirable and destructive H_2S. He has, to be sure, been appearing all along the line wherever the flow was sluggish or depressions in the sewers made pools. But in the septic tanks it is most violent and most destructive. Iron roof beams, iron steps, iron hinges, always beaded with moisture, rust away with incredible rapidity — not merely from H_2S alone but from the fact that the H_2S, having laid hold of a lot of oxygen from the moist air, has become H_2S O4—sulphuric acid. If the walls of the tanks are mortared, it eats the mortar, converting it into sulphate of lime.

The first time this odorous and odious malefactor was caught in the act was in the main sewer of Los Angeles. There even the drops of moisture hanging from the roof had been changed from water to noticeably strong destructive sulphuric acid. Engineers discussed it, tested it, found the same effect could be detected in the sewers of Berlin, compared notes and then forgot it. That was over ten years ago. But recently a perfectly good concrete septic tank in Hampton, England, succumbed to this same old H_2S. At this very time the same destruction is going on in a more or less degree all over the country. A lot of people have been blamed for this, but nine times out of ten at the bottom of the whole matter will be found H_2S.

So much for the destruction of property; but to go on with the process of sewage disposal, after the bacteria have become thoroughly fattened and contented with their free lunch proposition it is necessary promptly and ungratefully to kill them; because among the well-behaved germs are a number of undesirable citizens like typhoid; and this is accomplished as quickly and as humanely as possible in the outflow from the septic tanks by first spraying the sewage into the air to replace its oxygen, thus exterminating the under-water anti-fresh air members of the germ species; and, finally by dosing the sewage with some

form of lime to exterminate the few remaining members corresponding to our fresh air cranks.

This completes the process; but you will observe that it is a very lengthy, complicated process. In the first place, if sewage can only be fed into the bacteria communities at the rate of 3,000,000 gallons per acre per day, a large city having, for instance, 3,000,000 inhabitants, each using and discarding one hundred gallons of water per day, would have to set aside at least one hundred acres for sewage disposal. Could it afford it? Again, supposing in wet weather, ground water leaked into badly constructed sewers, and increased this amount; or suppose acid trade wastes interfered with the comfort and appetites of the bacteria, or cold weather made them languid and finicky, or suppose careless city officials neglected to clean the mud from the bottom of tanks and indifferent farmers failed to see the great advantage of it for fertilizer, then we should have a delay in the sorting process until the sewage had passed through and out into the river. Then, when conditions were just right, the sewage would re-putrefy and to everybody's chagrin and disgust, up would bob our old enemy H_2S.



Wooden Flumes in Which Hang Cast Iron Plates.
When the sewage runs down the flumes, the electric current jumps from one plate to another through the liquid, thus acting upon its foul contents. The flume at left shows the electrodes; that at right is in operation.

A glance at the engineering journals these days will show anyone that sanitarians are far from satisfied with sewage disposal results—so far. Here is an opportunity for some genius with a quick, simple inexpensive way of disposing of H_2S and Company; and, as usually happens at such junctures, it begins to look as if the genius had arrived.

He proposes to, and in fact actually does, dispose of H_2S painlessly and with dispatch, without flowers, hysterics or murmurings from the mob, as any good sheriff would—by electrocution. This is his scheme: There is, as formerly, a receiving tank for the collection of sand, etc., etc., down to the before mentioned umbrella frames; but here the similarity between old and new ceases. Without any septic tanks, any hordes of bacteria to herd and feed, or any sprinkling filtering schemes except a mechanical beating or whipping to break up the solids, he leads the sewage directly into the execution chamber—a small house containing a motor, a generator, controlling valves and switches, and a series of wooden flumes. In the wooden flumes hang series of cast iron plates alternately connected to the two lead wires from the generator that supplies a great many hundred amperes of current, but at the surprisingly low tension of two volts, so that the total yearly bill for kilowatt-hours is within practical commercial limits.

Now when the sewage runs down the wooden flumes, passing between the cast iron plates, the electric current jumps from one plate to another through the liquid and sets up a mighty boiling and bubbling, and an evolution of oxygen, hydrogen, chlorine and other gases which so completely fill the sewage that it looks like milk long before it has finished its thirty-foot course down the flumes. These myriad gas bubbles not only present to the decomposable matter of the sewage many thousand times the surface that comes in contact with air in a moving river, or even a wind swept harbor, but represent gas in the nascent state, gas just springing into life and as hungry as a week-old calf.

Before its ravenous attacks the organic compounds go down to their original clean elements like a card house.

Oxygen destroys the albuminates, the chlorine annihilates the typhoid bacteria and there is enough free sulphuric acid generated to kill cholera if cholera happens to be there.

But what of H_2S? This old destroyer of life and property is bound to appear in the midst of any decomposition process; but remember that the action of electricity on the iron plates is to dissolve them slowly, and no sooner does H_2S put in an appearance than it is seized and hand-cuffed by the vigilant iron salt, and led to execution.

Thus an old process, occupying much time and space, which allowed the old offender H_2S to go free, seems about to give place to a concentrated, instantaneous process which electrocutes him on the spot.

At one end of a thirty-foot flume is deadly sewage; at the other plain water, plain gases and salts of the earth. Twenty feet farther down the stream, ninety per cent of all bacterial life has ceased (a result not obtainable in several thousand feet of river) and one hundred feet farther the remaining ten per cent have died of free oxygen and homesickness. They could not survive their change of environment.

How will the new idea prove out? So far it has been thoroughly tried in but three places, all in dry warm climates—Ocean Park, Santa Monica, California, and Oklahoma City. Will it work in Northern, rainy climates, with more dilute sewage? Will it work in connection with leaky sewers that allow ground waters to run into them? Towns in the Dakotas are now sending their experts to Oklahoma to find out. One thing is very significant—the designer of the new system places the sewage, the electric machinery and the operator's desk and letter file all in one small building, and builds the building of steel and concrete. Under the old septic system with its rampart H_2S the metal of the generators would become green and poisonous, the handles of the filing cases would dissolve in sulphuric acid dew, the steel room beams would corrode, and wherever moisture hung on the walls, the concrete would turn slowly to calcium sulphate and crumble away. These new plants are either pure bravado, or else the science of sewage disposal is about to turn over a new leaf.

MEN AND MEASURES

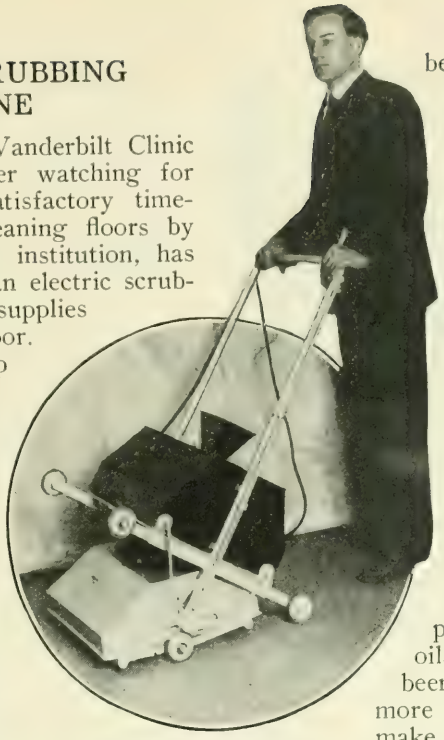
Measures, not men,
Our purpose high:
Yet men for the measures,
Lest the measures die!

—A. H. McQuilkin

ELECTRIC SCRUBBING MACHINE

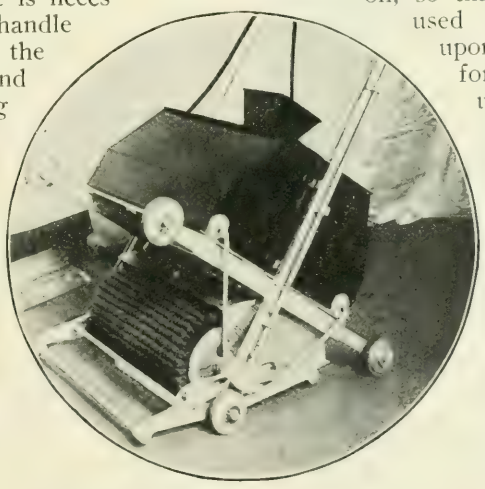
THE janitor of the Vanderbilt Clinic in New York, after watching for several years the unsatisfactory time-honored method of cleaning floors by hand scrubbing at that institution, has invented and patented an electric scrubbing machine which supplies clean water to the floor, scrubs it, and takes up the dirty water as fast as the operator can walk.

The motor is hidden under one end of the supply tank, and drives the brush at a speed of about four hundred revolutions a minute. The brush is seven inches in diameter, so its bristles travel about seven hundred feet a minute, sweeping the dirty water into detachable receiving tanks.



AUTOMATIC SCRUBBER IN OPERATION.

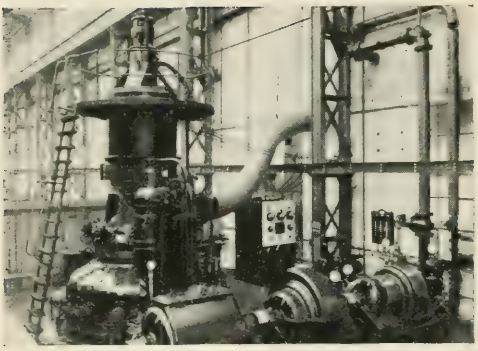
By a simple system of gears the brush can be adjusted so as to press lightly or strongly against the floor, and thus can be used effectively until it is worn out. The machine works the same in either direction, thus obviating the necessity of turning it around. When the wall has been reached all that is necessary is to swing the handle over. This reverses the action of the motor and of the brush, shutting off the water on one side and turning it on on the other. This keeps the bristles straight and therefore is much more effective than by running continuously in one direction. The inventor claims that this method of scrubbing floors is far more sanitary than the ancient method of hand scrubbing, because it forces all the dirt from the floor and carries it away, instead of grinding it into the floor.



THE AUTOMATIC SCRUBBER, WITH ONE RECEIVING TANK REMOVED TO SHOW THE BRUSH AND SPRINKLING PIPE.

IF WE USED GAS TURBINES

SHOULD we be able to use gas turbines in the same way as steam turbines are now employed, it is thought that this would make almost a revolution in the way of obtaining power from gas or oils. Inventors have been trying vainly for more than ten years past to make a turbine which would resemble a steam turbine, but using gas explosion to drive the wheel instead of steam. On the other hand, gas engines have now been brought to a great state of perfection, but this principle could not be applied to a motor of the turbine kind. A German engineer, H. Holzwarth, has now built a 1,000-horsepower gas turbine, and claims that it works very well upon gas or vaporized oil, so that liquid fuel can be used to great advantage, upon shipboard as well as for a wide number of uses where power is needed. What is remarkable is that the weight is only a quarter of a gas engine for the same power. Our view shows it built together with a dynamo, with the turbine next the floor and the dynamo above. The gas explosion occurs in a number of chambers opening on to the central wheel,



GERMAN-BUILT GAS TURBINE.
Its weight is only one quarter that of a gas engine of the same power.

and the explosions drive the wheel in turn. This allows one chamber to be cooled down while the next is operating and this cuts down the great heat of the explosion which made it impossible to build a gas turbine up to the present, as were it not properly cooled it would soon be brought to a white heat. The inventor claims that the yield from a given amount of fuel is at least equal to that of a steam engine.

COLONEL MOSEBY, THE CONFEDERATE GUERRILLA LEADER, POSING FOR MOVING PICTURES.

COLONEL MOSEBY IN MOVING PICTURES

COLONEL MOSEBY has always been the best known of the daredevil heroes of the Civil War. This is largely due to the dashing exploits in which he participated during the war but is probably more largely due to the region in which his raids took place. He was the guerrilla leader of a free lance body of horsemen, never more than a hundred strong, who harassed the enemy in that portion of Virginia not far from Washington. There is no question about the brilliance of his exploits. They were, however, carried on almost under the eye of the correspondents of the national capital and Washington has always been the greatest news center in the country. So Colonel Moseby's exploits were constantly in the papers during war times.

Colonel Moseby is himself a prolific writer and from his pen have come many volumes of reminiscences. He has lived for many years in Washington and has continued in his close relationship with the newspapers and the magazines. The name of Moseby is still on the lips of all who turn their attention to the exploits of the recent unpleasantness.

Not long ago a moving picture firm was anxious to portray some of the thrilling scenes of the war and decided that they should settle upon the Moseby raids. The Colonel himself was induced to pose in that connection and in the above photograph he is to be seen in the embrace of a little moving picture actress who was a member of the cast.

Thus the deeds of Colonel Moseby will not go down without a record of that verisimilitude of action that the moving picture films so wonderfully reproduce. It would be a worthy idea to reproduce, wherever possible, the deeds of the, comparatively, few surviving men who brought glory upon themselves in the great Civil War. It would be a direct and inspiring lesson in patriotism to the youth of the land.

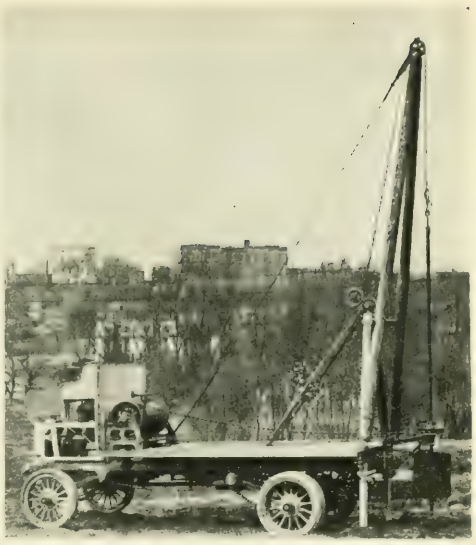
DIGGING POST HOLES BY GASOLINE POWER

THIS new post hole digger and derrick is said to be one of the most novel applications of the motor truck so far made. It consists of a three-ton chassis, which is backed up to the curb or wherever the telegraph, electric light, or electric transmission line is to be constructed, and in a few minutes, with the use of its gasoline engine as power and the derrick and drilling apparatus provided, it digs a hole seven feet deep and then with the power of the engine hoists the largest and heaviest pole and lowers it into the hole without difficulty.

It will be seen that the truck has a platform at the rear reinforced with heavy I-beams and over the rear end of the truck is erected a boom. This boom supports the drilling apparatus, which is a modified carpenter's expansion drill.

The apparatus includes a drill about one foot long which has a disk-shaped plate with tooth-cutting edge which throws up the earth as the drill bores into it. The disk, as will be noted in the illustration, supports the core of loose earth, and at a signal to the driver of the truck the drill can be raised and drawn from the hole by a cable attached to a standard which is operated by the gasoline motor of the truck.

When the hole has been drilled and the dirt removed, the chain is fastened about the pole to be set and in a jiffy the pole is hoisted and dropped into the hole that has been dug. There are great money-saving possibilities for the post hole digger and derrick as two men working together can dig only about four post holes in a day and at that it takes a very considerable gang of men, after the holes are dug, to set the poles and tamp the earth around. This invention can haul the poles to the spot selected, dig the holes, and then set the poles



THIS MACHINE WILL DIG A POST HOLE SEVEN FEET DEEP IN A FEW MINUTES.

OLDEST HORSE IN UNITED STATES

THIS horse, declared to be the oldest in the United States, is owned by E. T. Bigelow of Fairfield, Maine. She is forty-one years old. She was raised by Levi Dow of Waterville, but since becoming old enough to vote, she has been in the Bigelow family. Every day she is driven and goes to Waterville, making the distance of eight miles in a little more than an hour. She is as free and easy to go as a colt. All her life she has worked and though small has a great deal of energy. Now she is fat and plump and her teeth do not show her to be more than thirteen.

E. T. BIGELOW OF FAIRFIELD, MAINE, AND HIS FORTY-ONE-YEAR-OLD HORSE.

AN ENGLISH SUBMARINE THAT WAS FITTED WITH WIRELESS EQUIPMENT FOR CONTROLLING HER FROM ANOTHER SHIP.

WHAT WIRELESS IS DOING

By

R. G. SKERRETT

THE span of wireless telegraphy is rapidly widening. It was but a short while ago that Mare Island, California, and League Island, Philadelphia, a distance of 3,150 miles, were in aerial communication; and one of our naval vessels bound for the Philippines was "picked up" by the wireless station at Los Angeles when the ship was quite 3,000 miles away. All of this is astonishing, and yet it is but one direction in which ether waves can be put to service.

The science of telautomatics is that branch of "wireless" in which ether waves are used for the purpose of directing some mechanical movement at a distance without employing connecting wires.

Within the past few months England, Germany and France have taken up the problem anew to give it a practical value, and in the United States the same question has been approached in another way with encouraging results.

The experiments in Europe have been principally confined to that of guiding either submarines or torpedoes by means of Hertzian waves—ether disturbances of electrical origin. The three nations in question have quite carefully guarded the results of their experiments and particularly the apparatus employed, but it is known that in England the submarine so equipped was able to go through many of the maneuvers which it ordinarily performs under the guidance of its crew. The directive impulses were sent from a cruiser fitted with a wireless outfit.

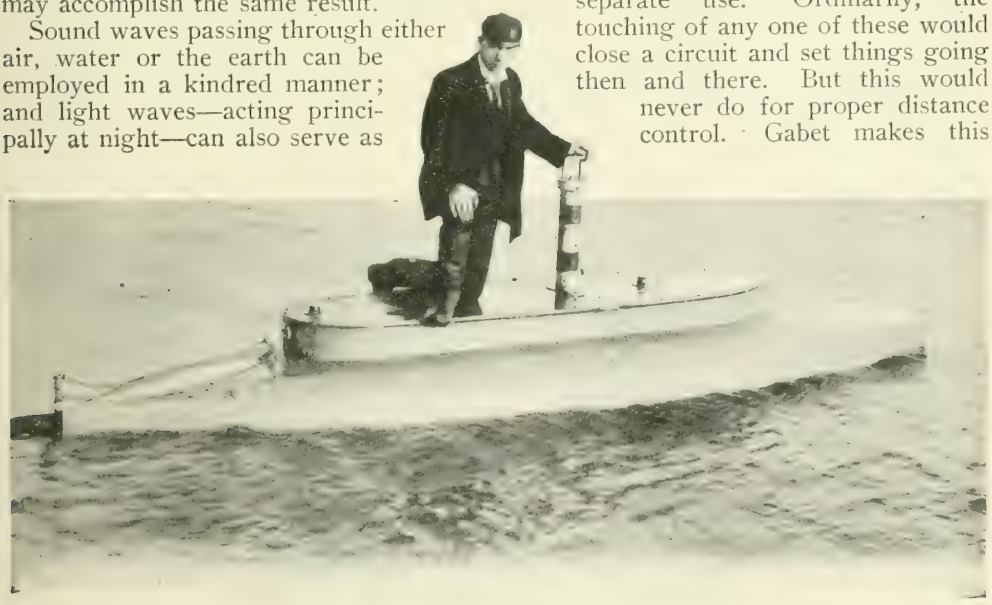
The mere idea of giving a submarine this power of action without having a crew on board opens up startling possibilities. The first thought is, No one need be exposed aboard to the hazards which now exist even in time of peace. But that phase of the matter is of secondary importance to the military mind. When the human factor is eliminated from the submarine, the vessel becomes radically different so far as her internal requirements are concerned. It becomes truly a machine in every particular, and space and weight which had to be utilized for the safety and the convenience of the living crew can be put to other uses, and means of propulsion can be employed which could not be used with equal facility or security if men were aboard.

In addition to this, an under-water craft guided and managed by ether waves could be conveniently equipped with a fairly large number of torpedo tubes or torpedo-launching frames, and, with this extra armament made possible by weights saved otherwise, a submarine of this sort would be far more formidable as a dirigible base from which to discharge torpedoes. Of course, the essential part of the whole scheme is that the guiding station should have the submarine always responsive to the director's command, and this involves some difficulties which are being met in different ways by the present experimenters. However, the mind of the man of peace is sufficiently alert to picture some of the possibilities of a military instrument of this sort; and there are other directions in which this means of wireless control can be used to advantage.

The general public knows enough about wireless telegraphy to understand that waves are created in the ether by an electrical discharge at the sending station, and these waves travel through the air to a receiving station where they induce action in a delicate coherer which makes and breaks a local electrical circuit. But Hertzian waves of this character are not the only waves which may accomplish the same result.

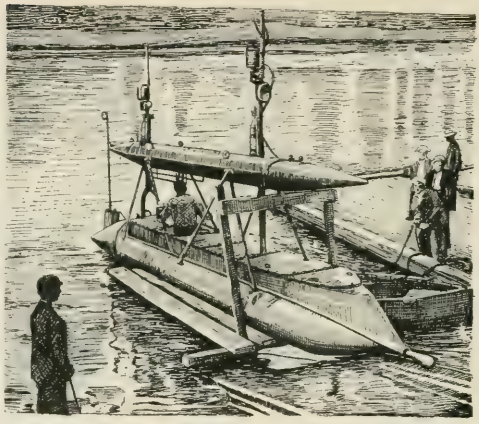
Sound waves passing through either air, water or the earth can be employed in a kindred manner; and light waves—acting principally at night—can also serve as a means by which to set in motion or arrest some mechanical action at a distance. But in every case electricity serves as an agent to transmit the message or impulse of those waves directly to the mechanism to be set going. The waves that span space are, in themselves, too weak to provide energy for a display of power, but they answer, like a little child, to bear their message to another source which is capable of putting some vigorous action in motion. The receiving station, in each case, brings into play a local reserve or "relay," as the electrician expresses it, and this relay is strong enough to do the work required, that is, to open a valve, swing a lever, or operate the electrical switches that may be needful to start, stop, or reverse some form of motor. This, in brief, is the foundation of the science of telautomatics.

In France, the Gabet wireless submarine or torpedo boat has been directed from a distance. It was found that the little vessel responded to the guiding Hertzian waves within one-sixth of a second from the time they were dispatched from the sending station. In the Gabet system, a hand, something akin to that of a clock, passes over a number of contacts, each of which is for a separate use. Ordinarily, the touching of any one of these would close a circuit and set things going then and there. But this would never do for proper distance control. Gabet makes this



THE GARDNER WIRELESS SUBMARINE, WITH MR. GARDNER ABOARD.
This vessel is controlled by submarine sound waves.

hand sweep completely back and forth across all of these connections in a very short period, and the hand must stop at the right contact for a longer while before the circuit is properly closed, in order to start the particular movement for which that contact is designed. It is this interval of lag which furnishes the margin of security and allows the connecting hand to settle upon the chosen contact—mere passing rapidly over the others does not produce any result. With the present methods of "tuning," the receiver on the submarine or torpedo can be made responsive only to waves of a certain arbitrary length. This minimizes the effects of interference by other waves generated at an enemy's station. The experiments in England and in Germany have been along kindred lines so far as the employment of Hertzian waves has been concerned, but the governments of neither of these countries have given out details. There are, of course, several ways of accomplishing the same end, and the Gabet system is only one of them.



THE GABET EXPERIMENTAL SUBMARINE AT THE INSTANT OF LAUNCHING.
The little craft is directed by Hertzian waves.

The aeroplane is now being fitted with apparatus for receiving and transmitting wireless messages over space from a height of quite five thousand feet. In a way, the task is somewhat more difficult than that of guiding a torpedo or any form of naval craft, but there is nothing impossible in the problem, and the dirigible balloon and the aeroplane in the near future will probably be directed by some form of wireless for certain kinds of military service where the presence of a human director or observer may not be needed. All of this may seem astounding now, but actual achievements have blazed the way to their attainment. We are living in an age of rapid and tremendous strides.

The House Builder

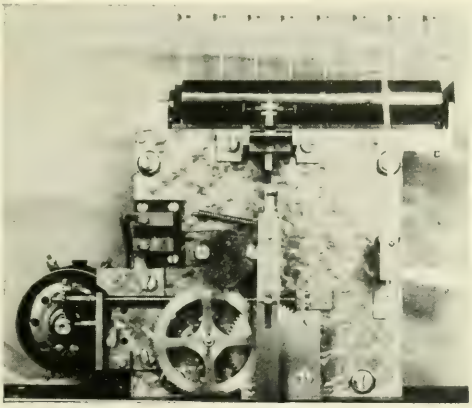
The house-builder at work in cities or anywhere,
The preparatory jointing, squaring, sawing, mortising,
The hoist-up of beams, the push of them in their places, laying them regular,
Setting the studs by their tenons in the mortises, according as they were prepared,
The blows of the mallets and hammers—
Paeans and praises to him!

—WALT WHITMAN.

THE STEPLESS STREET CAR AS IT MADE ITS FIRST APPEARANCE IN NEW YORK CITY.

FIRST STEPLESS STREET CAR

STREET car travelers of New York and other cities of the United States will soon be using a new type of car. The aged and women and children will undoubtedly welcome the advent of the new "stepless" car which will add to their comfort and conveniences and also reduce danger. The accompanying illustration shows the first of these cars to be operated in New York. It is now making its daily run on the Broadway Line from 59th Street and 7th Avenue, the terminus to South Ferry. Passengers climbing in and out of the street cars are in almost constant danger, resulting in many injuries. In the new car the floor is placed only ten inches above the street. In the old style of cars, the floor is from thirty to forty inches above the street. Passengers enter and leave the car at the middle, so that they travel the shortest possible distance from the street to and from the seats in the car. The principal advantages of the stepless car are the prevention of accidents and the saving of time in loading and unloading passengers. No grab handles are needed and passengers mount and alight without effort or hesitation. The street car company is as well pleased with the new type of car as are the passengers.



THE WINDING MECHANISM OF A CLOCK THAT IS DRIVEN BY A MOTOR.

MOTOR DRIVE CLOCK WINDING MECHANISM

A NOVELTY in the field of electric motor application may be noted in the accompanying photograph. This is an attachment of a miniature motor to the complicated mechanism of large hall clocks. Clock makers have in the past followed a general rule for winding which necessitated the use of three brass weights, one driving the time train of gears, weighing approximately fifteen pounds and a third attached to the quarter hour stroke weighing from thirty-five to forty-five pounds.

These weights were wound up by hand, three different insertions of a key being required to perform the operation. The idea of winding the clock by electricity simplifies its construction and renders the whole self-sustaining.

The motor used is a universal 110

A Road Ready to Be Burned.

nature is changed and it is no longer sticky. In many regions where there is black mud there is an absence of other earth that may be used in road building. It often happens, also, that wood is plentiful. Where this is true it is economically possible to lay a framework of wood, place clay on top, ignite the pyre and so burn the black clay as to change its nature.

volt one-thirtieth horse power service motor geared to the time train of the clock by a worm. It will be seen in the illustration that this train in turn drives the two striking trains, a single weight now being raised in place of the three formerly used. The use of this motor is strictly intermittent as it runs but one and one-half minutes every twenty-four hours. The opening and closing of the circuit being accomplished by a cleverly constructed special switch of the commutator type.

When the weight is raised to its maximum height it is found that there is a reverse power sufficient for twenty-four hours should the electric service fail at any time, and the switch is set to close the circuit between the hours of four and five in the morning which makes allowance for the intermittent service.

The Good Road That Is Made with Fire.

FIRE TO MAKE GOOD ROADS

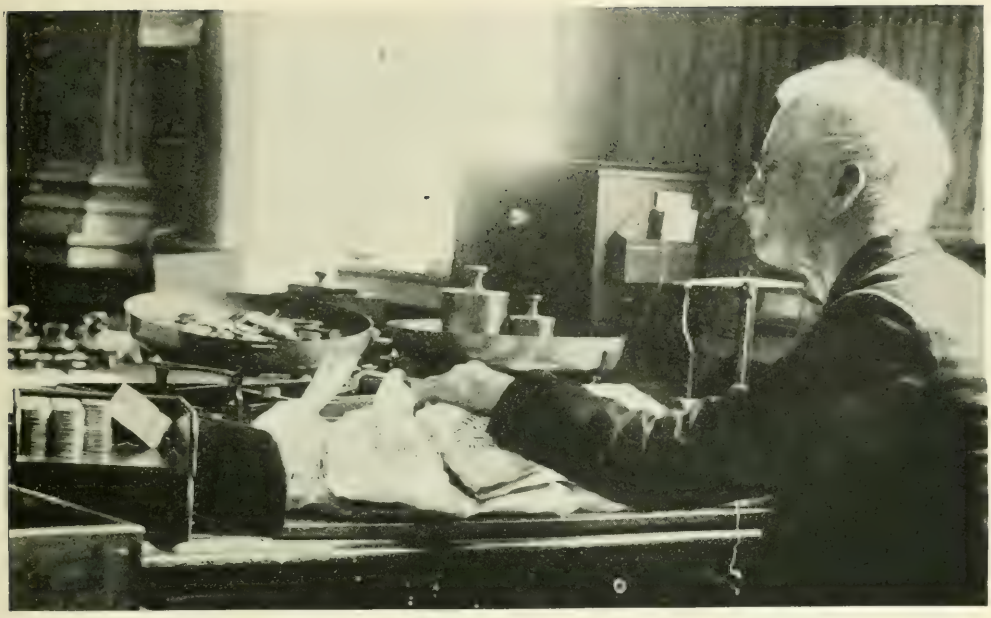
HERE is shown the process of converting a sticky, black-mud road into one as good as macadam by the use of fire. When the black mud is burned its

OUR STOCK OF YELLOW METAL

THE government of the United States now possesses the largest stock of gold in the world. It amounts to nearly a billion and a quarter dollars' worth of the metal—the exact figures being $1,009,000,000 coin and $190,000,000 bullion.

On occasions, the possession of such a vast amount of hoarded wealth may prove embarrassing. Thus it happened, not long ago, that in view of an impending crisis with Japan, the authorities at Washington got scared about the safety of $276,000,000 worth of gold which was stored in San Francisco. Suppose the Japs should grab it!

A Black Mud Road Being Burned.



COUNTING AND PACKING GOLD PIECES IN SACKS AT THE TREASURY DEPARTMENT IN WASHINGTON.

Horrible idea! Too terrible indeed to contemplate.

Lest such a thing happen, the entire amount, in coin and bars, was shipped from San Francisco to Denver, at a cost of $276,000—the express charges on gold being $1 per $1,000. This largely accounts for the fact that there is now at the mint in Denver $405,000,000 in gold coin and $35,452,000 in bullion.

This vast amount of yellow metal is packed away in a huge box which stands on concrete pillars, the arrangement being such that those employed in guarding it can walk not only all around the box but over the top of it and beneath it. It is divided into a series of twenty-two compartments. One compartment contains $30,000,000 in gold eagles, another an equal sum in half-eagles, and so on.

In the Philadelphia mint at the present time there is $307,000,000 in gold coin and $18,000,000 in gold bullion—this being another great depository of the government for the yellow metal in mass. At San Francisco there is $38,000,000 in coin, and $75,000,000 in bullion, which it is to be hoped the Japanese will not confiscate. The New York Assay Office holds $60,000,000 worth of gold bullion.

LARGEST NAVAL COLLIER

THE United States Government has recently put into service the *Neptune*, said to be the largest naval coaling vessel afloat. This collier has a length between perpendiculars of 520 feet, a length over all of 542 feet 10 inches, a beam of 65 feet 3 inches, a mean draft load of 27 feet 7½ inches, and a displacement on load draft of 19,440 tons. The *Neptune* has a capacity of 12,500 tons of coal and a speed of 14 knots per hour, and she is capable of delivering 110 tons of coal per hour to a warship.

THE *Neptune*, SAID TO BE THE LARGEST NAVAL COLLIER AFLOAT.

MOVING PICTURES FOR THE AMATEUR

By

FREDERICK A. TALBOT

Gianni Bettini, an Italian inventor, has recently perfected a new device which makes it possible for almost any amateur photographer to make his own moving pictures. Not only does the new mechanism bring the cost within the means of the average amateur, but the resulting pictures are actually clearer and sharper than those produced in the ordinary way by the use of a moving film of celluloid.

In accomplishing these astonishing results Bettini has exactly reversed the principle of the usual moving picture machine, in which the film travels back of the lens from spool to spool. His photographs are made in series on a glass plate, which is held rigid, while the lens, itself, moves.

The glass plates used in the Bettini machine measure eight and one-half inches in length by five and one-half inches in width. The photographs taken in series on this plate are only five-sixteenths of an inch in width by one-quarter inch in depth. In this way sixteen consecutive pictures appear in a line and on each plate there are thirty-six lines, making a total of 576 images. The photographs are taken at the rate of twelve or more a second as the lens travels to and fro.

The cost of a plate of this kind is four cents, while a celluloid film long enough to carry the same number of pictures costs $1.50. The Bettini camera is sold for less than one-third as much as the regular moving picture camera and it is also used in connection with an ordinary stereopticon for reproducing the pictures, thus saving further expense for apparatus.

In the use of the Bettini reproducing apparatus one glass plate may be instantly followed by another, so that a series taking nine minutes may be displayed without any interruption.

What the phonograph has done to bring music and song into the home the Bettini machine is expected to do for the historic and interesting scenes of the world.

THE amateur photographer who has now become ubiquitous, has manifested discontent with his restriction to still life photography upon his spool of film in a camera which packs so flat that it slips into the pocket. He has become possessed with the desire to take photographs in motion, so that he may be able to replay his favorite base-ball match, the yacht race, a local topical event of importance, scenes in foreign countries and so on just whenever he pleases in his own drawing room, in precisely the same manner as he can turn on his favorite operatic nightingale, humorous jester, orchestra, or orator by the aid of the talking machine.

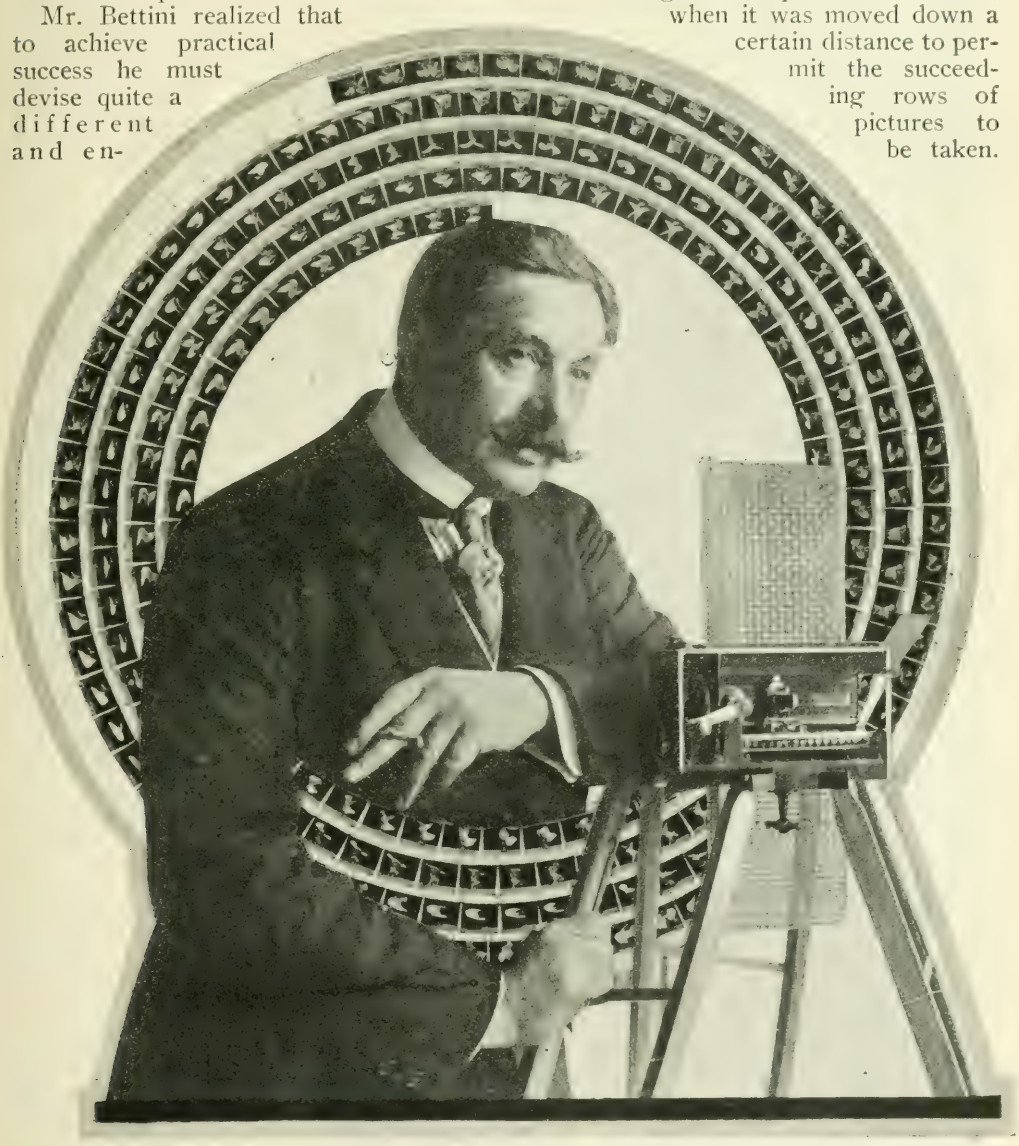
Up to the present the aspirant's longing has defied fulfillment. The moving picture camera which supplies the pictorial pabulum for millions in our picture theaters is heavy, bulky, and costly. The celluloid which the machine eats up greedily in its pictorial recording work is expensive; developing and printing demand elaborate apparatus; and finally the projector is a complicated and difficult mechanism to handle in the limits of a private house. Numerous ingenious attempts have been made to eliminate these heavy disadvantages but to no purpose, and so the coming of the moving picture fiend has been delayed—in fact it has seemed as if his day never would arrive.

However, an Italian inventor has now come to the rescue. No longer will it be necessary to venture outside the home to see a moving picture show, and the expense has been so reduced that it becomes no more an inaccessible hobby than ordinary snap shot photography. There is no risk from fire and the whole principle is so simple that no tedious and protracted inculcation is demanded in mastering the art, while the results are equal, if not superior, to what are obtained with the conventional apparatus.

This inventor, Mr. Gianni Bettini, well-known in connection with his ingenuity in the perfection of the talking machine, has achieved success after five years of continuous and arduous experiments attended with repeated galling failures. When he attacked the problem he realized that some cheaper medium than the celluloid ribbon would have to be used if the idea were to be brought within the reach of the man in the street. So he set to work to adapt glass plates, such as are used in the ordinary stand camera, to his purpose. Not that he was the first to make this experiment by any

means, for efforts in the same direction were made in the very earliest days of cinematography — by Jansenn, Marey, and other investigators — but they achieved very little success. They worked rather upon the principle of six or eight pictures to a plate, which was quite a hopeless effort, the pictures being taken in a ring with a photographic gun, wherein the plate revolved.

Mr. Bettini realized that to achieve practical success he must devise quite a different and entirely new principle. Accordingly he took the glass plate and set to work recording upon its sensitized emulsion rows of pictures, each less than half an inch square, across the plate. He built a special camera resembling a thin wide drum. The mechanism was placed within this flattened cylinder to move the plate step by step transversely past the lens until the edge of the plate was reached, when it was moved down a certain distance to permit the succeeding rows of pictures to be taken.



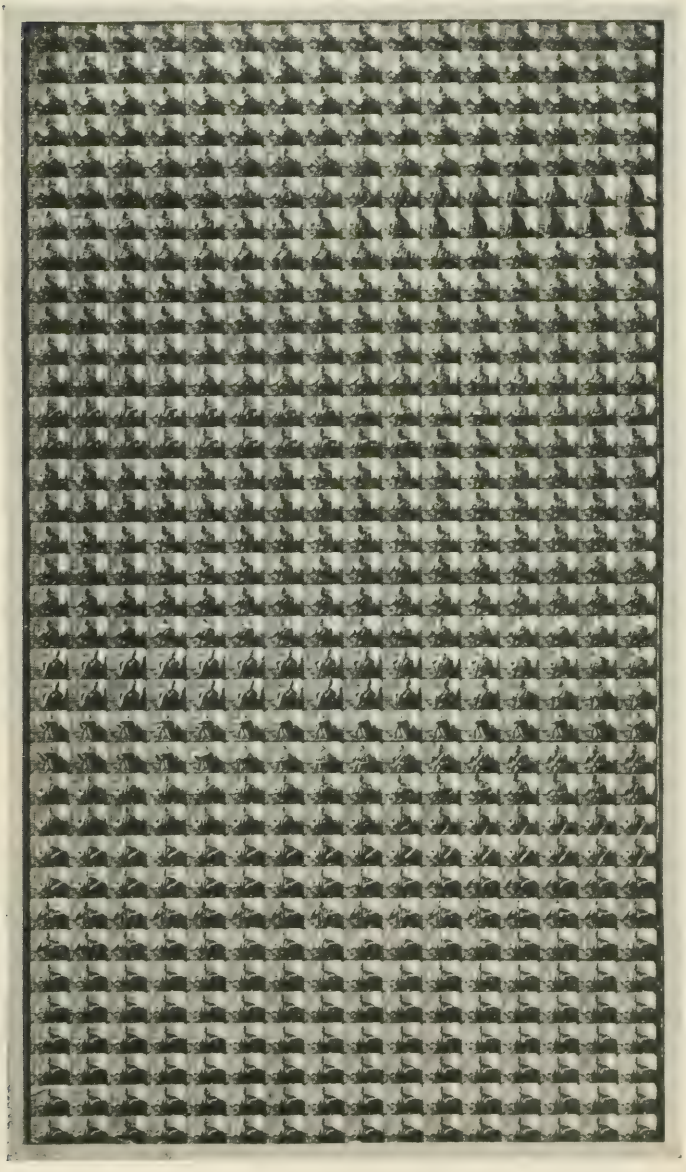
GEORGE BETTINI, THE INVENTOR, AND HIS CAMERA FOR TAKING CINEMATOGRAPHIC PHOTOS ON ORDINARY GLASS PLATES

MOVING PICTURES UPON A DISC.
The images are set out in the form of a spiral.

The apparatus, however, was ungainly, clumsy, and noisy in operation so that it possessed no commercial value. Accordingly this novel camera was scrapped.

In its stead a more compact and small apparatus has been evolved. This measures about eight inches in length, by some four inches square, and is fashioned of aluminum in order to secure lightness. It is no larger nor more inconvenient to carry than the ordinary snapshotting instrument. In this camera instead of the lens being rigid and the plate moving, as in the case of the ordinary cinematograph instrument where the ribbon travels from spool to spool intermittently, he adopted and perfected a diametrically opposite principle. *The plate is held rigid and it is the lens which moves.*

The lens is mounted upon a small horizontal shaft having a thread which is gripped by a scissor like attachment which opens and closes under the action of a spring. This lens holder moves intermittently from side to side. The axis of the lens is at right angles to the plate which is vertical and the light is deflected at right angles through the lens upon the sensitized surface by means of a prism.



Moving Picture Portraits Taken in a Room, with Ordinary Light.

There is one peculiarity, which must be explained, as it is obvious. When the moving lens is at the extreme front edge of the plate it follows that the resultant figures in the picture must be slightly larger than when the objective is at the opposite side of the plate, because in the former position it is nearer the object. The diminution is gradual and almost imperceptible upon the plate itself, but nevertheless it exists. This would appear to be a disadvantage, but it is corrected in the projection as will be explained later.

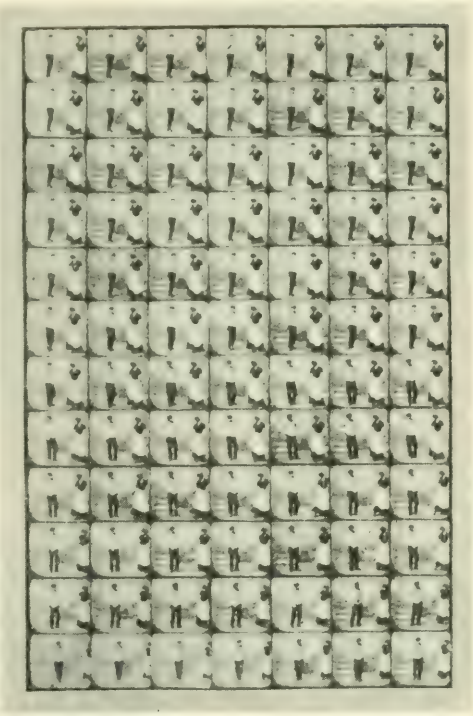
The plate used by Mr. Bettini measures about 8½ inches in length by 5½ inches wide. The pictures are recorded transversely across the plate in regular rows as shown in the accompanying

illustrations, each picture being 5/16 of an inch in width by ¼ inch in depth. In this way 16 consecutive pictures are obtained in a line, and as there are 36 lines of pictures, a total of 576 images is recorded upon a single plate. The lens moves from point to point along its shaft during the fraction of a second the light is cut off by the passage of the sector of the revolving shutter. The lens travels across the plate until it reaches the end of the line, when while the lens is covered the plate moves down about ¼ inch and the next row is commenced. The lines of images are thus secured at the rate of twelve or more per second as the lens travels to and fro.

Owing to the pictures being taken upon a more transparent base than celluloid the resultant pictures are extremely clear, bright, sharp, and full of detail, and this renders the process extremely valuable for all classes of work. Indeed, for scientific cinematography, the glass plate is preferable to the celluloid film for this very reason.

In projection the self-same instrument which is employed for taking the pictures is used in conjunction with an ordinary stereopticon, so that no expensive apparatus is required to throw the picture upon the screen. Now, in projection the picture at the left hand side of the plate which was taken in the camera with the lens farthest removed from the object, and wherein the figures are smallest, is now brought closer to the light and the farthest removed from the screen, whereas the picture taken nearest the object and consequently the larger is now brought nearest to the screen is relatively smaller, although as a matter of fact it is exactly of the same dimensions as the one at the opposite edge. Consequently, in projecting, the objects in each successive picture are converted to common dimensions.

Another advantage of the system is that glass plate after glass plate may be fed through the camera without the slightest interruption, as there is no break whatever between the last line of images on the one plate and the first row of pictures on its successor. The plates are carried in a magazine and are fed through the camera by a rack attachment, the edge of the plate itself forming



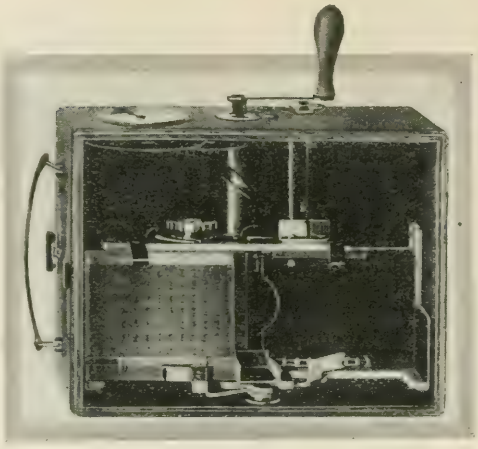
ANOTHER ONE OF THE PLATES TAKEN WITH THE NEW CAMERA.

the border of the row of pictures. Consequently one can keep the apparatus going so long as there are plates available, and as the magazine will carry twelve plates at least, a continuous record of 6,912 pictures are obtained, which at the rate of twelve pictures per second gives a show lasting nine minutes.

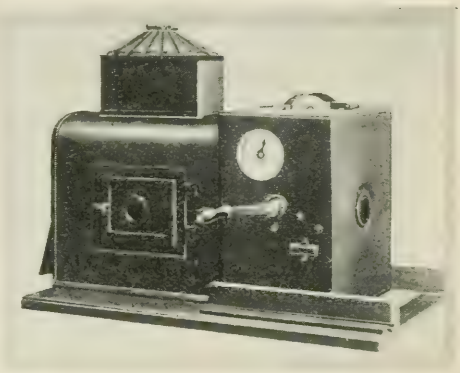
Of course, the great recommendation of the system is the low initial cost of the apparatus and the cheapness of the pictures. The camera costs about a third of the ordinary cinematograph instrument while a single glass plate costing only four cents is equivalent to thirty-six feet of celluloid film costing about $1.50. The inventor has also adapted the spool film used with ordinary snap shotting cameras to the same idea although in this instance the positives have to be printed from the film on to glass plates. This, however, owing to the simplicity of the printing system is an easy undertaking.

Another ingenious achievement has been accomplished. This is the transference of pictures from an ordinary celluloid negative obtained with the

familiar cinematograph camera, to the glass plate. In this instance it is possible to make the images upon the glass plate even smaller, obtaining no less than 1,024 upon a surface measuring 8½ inches by 5½ inches, with no sacrifice of detail, brightness, or clearness. In this instance the saving is still more pronounced as a plate costing four cents will give the same results as sixty-four feet of celluloid ribbon costing $2.50.



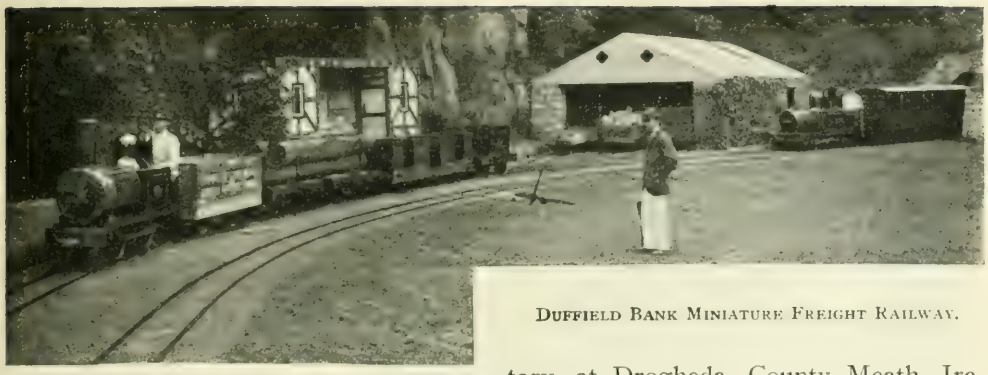
THE CAMERA.



CAMERA, WITH LANTERN BEHIND, FOR PROJECTION ON THE SCREEN.

Still another remarkable adaptation of the same idea must be recorded. This is the preparation of records upon circular discs similar to the records for the talking machine. The pictures are set out in the form of a spiral, and the arrangement is such that the disc is brought to rest for a fraction of a second with the relative picture before the light. In this instance the illuminant employed is a small four volt metallic filament incandescent electric light, such as is used for electric flash torches, the pictures being thrown upon a screen twenty-four inches by eighteen inches which can be stood upon the table. The cost of the apparatus is very low, while the records can be prepared so as to sell cheaply. The inventor has succeeded in compressing sufficient pictures upon a disc fourteen inches in diameter to give a projection ranging from two and one-half to three minutes in duration.

It may be truthfully stated that no development concerning motion photography has succeeded in bringing this art within the reach of all, so much as the Bettini *Cinema-a-Placque* as it is called, and it should popularize moving pictures to a remarkable extent, inasmuch as it brings them into the home in the same manner as the talking machine has brought sounds to the fireside.



DUFFIELD BANK MINIATURE FREIGHT RAILWAY.

MINIATURE RAILWAYS IN GREAT BRITAIN

THE accompanying illustrations show some interesting British miniature railways in operation in Ireland and England for the past four decades.

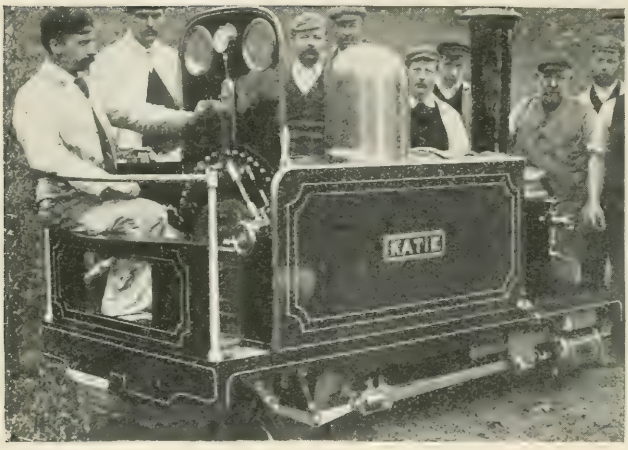
On one of these miniature railways there are three kinds of tickets, first, second and third class, printed as noted in the form shown herewith. This was on the B. R. Co., for use between Lime Tree and Belmore at Julianstown Rectory, at Drogheda, County Meath, Ireland.

This line was constructed by the Rev. John Evans Preston, the small coach seen in the photograph being of his own idea and model. The locomotive is worked forward and reverse by levers with which it is equipped.

The train of cars on this line makes good speed and carries without difficulty a load of sixteen children. The pastor laid out the line himself.

The train carries a number of adults, making the usual stops at stations with a

A PASSENGER CAR ON THE IRISH MINIATURE RAILWAY AT DROGHEDA.



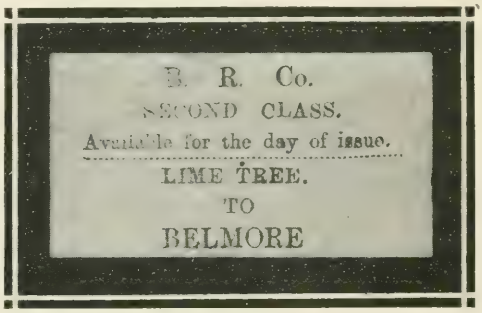
A Locomotive on the Eaton Railway.

complete system of signals and two cross overs as well as several curves and sidings. This miniature railway is several thousand feet long and has several stiff gradients which are negotiated without trouble by this unique equipment.

A line somewhat similar to this was established at Eaton Hall, near Chester, England.

The first cars measured only four feet by two feet inside. It soon became apparent, however, that a gauge of fifteen inches could carry with safety a much larger vehicle. In fact it may be taken as a reasonable rule that the floor area of narrow gauge cars should not be less than four times the gauge in length and twice the gauge in width. Such a car was found very handy for light work, but on the Eaton Railway there was adopted an over measurement of six feet by three feet with one for three inches depth of side. The wheel base is, in all cases, half the length of the car.

These little railways have proved very convenient for those people in the rural districts who wished quick transportation between places not far apart, at a low cost.



One of the Tickets Used on an Irish Miniature Railway.

LARGEST OF FLYING CAGES

ONE of the wonders of the New York Zoological Park is the great flying cage for large water birds. It is 152 feet long, 75 feet wide and 55 feet high. It is designed to give the birds a section of nature's own domain. In this they can fly to and fro, build nests and rear their young in real freedom. The gigantic cage is the summer home of a mixed flock of large and showy water birds, such as pelicans, herons, egrets and flamingoes. As they fly about within they afford bird students and the public an opportunity to study their movements and attitudes. A striking photograph of this huge cage is herewith shown. The whole structure consists of a series of steel-pipe arches and purlins, the former eight feet apart, over which wire netting has been tightly stretched. It completely encloses three forest trees of very considerable size, two hickories and an oak,

The Largest Flying Cage in the World.

and it contains a deep pool of water one hundred feet long. The collection of birds at the New York Zoological Park amount to nearly three thousand, of different kinds and sizes, gathered from all parts of the world. One of the most picturesque scenes in the big flying cage is at three o'clock daily, which is dinner time for the great army of feathered boarders. A large crowd usually gathers on the outside to witness this event. Among the most anxious and hearty of the eaters are the giant pelicans who open their ponderous beaks a foot or more awaiting a whole fish which is thrown to them by the keeper.

AMERICAN FLOUR FOR HONG KONG

THE Orient is proving a splendid market for all sorts of products from the Pacific Northwest. The train shown in the accompanying illustration was loaded with 50,000 sacks of flour from a Spokane mill destined for Hong Kong, China. It required two engines to pull it across the Cascade range. The flouring mills of Washington pay especial attention to the Far East trade and millions of bushels of wheat eventually find their way across the Pacific.

REMARKABLE ELECTRIC MINING SHOVEL

THE photograph shows a most remarkable electrically operated shoveling machine as employed in mines, for underground hauling of ore, and for work in taking material from beneath a dumping trestle.

NEW ELECTRIC MACHINE FOR WORK IN MINES.

This machine is operated by one man and is self-propelling, forward and backward, at variable speed.

It will work on either a smooth or rough floor or it will spade into the material above the floor while material can be shoveled in lumps as large as will go into the scoop. This material may be discharged immediately behind the machine or to either side of the track and it is claimed that in handling materials the breakage is less than by hand shoveling, while the conveyors constitute picking tables where materials are to be separated or impurities picked out if desired.

The device can excavate rock, after blasting, and all loose material, reasonably free from water; it may also be employed to do either light or heavy highway or railway grading and to strip soil from horizontal mineral deposits, as well as to mine ores and other minerals in

TRAIN LOADED WITH FIFTY THOUSAND SACKS OF FLOUR DESTINED FOR HONG KONG, CHINA

open trench work or to take the place of stock house crews in blast furnace work. It weighs from 6,000 to 7,000 pounds.

The electric underground machine is designed to work in tunnels of five to six feet in height. It has a rear conveyor which swings laterally and will load cars on the same or on a parallel track. The weight of this machine is 9,000 pounds and its length is twenty-two feet six inches while the height measure three feet eleven inches.

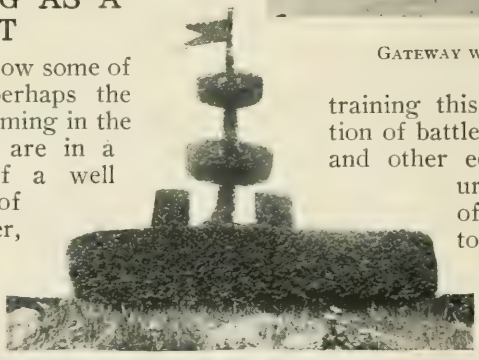
Its capacity is said to be 2,100 pounds of coal, and it is claimed that accurate notes taken in the mine show the average working capacity of this machine to be 21.3 tons per hour including the loading and shifting of the cars and the moving of the machine.

TREE TRIMMING AS A FINE ART

THE illustrations show some of the effects of perhaps the most unique tree-trimming in the world. These trees are in a grove or garden of a well known horticulturist of the name of Moser, near Versailles, southwest of Paris. M. Moser has spent over ten years in training this most unusual collection of battleships, arches, pagodas, and other equally interesting figures to the present state of perfection. Of course to maintain these results, constant care is required, as new shoots, leaves and branches are continually being put forth, and also, dead or damaged parts must be carefully and skilfully removed. Some sections of the garden are indeed older than ten years, as some of these works were designed fifteen and even twenty years ago. They look as if an architect and not a gardener had been in charge. The details of the "Dreadnaught" as designed by M. Moser, are quite realistic. Note the general appearance of the whole, the smoke stacks, the mast, with its lookout stations, surmounted by a flag. The pagoda, evidently fashioned after a Japanese design, for the flag of the Nippon kingdom is shown flying, is not altogether of living vegetation. In fact the frame is of light woodwork, and wire netting is used for railing in the little porches.

The effect of this garden is certainly unique and unusual.

GATEWAY WITH JAP PAGODA.



A "DREADNAUGHT."

PHOTO COPYRIGHT BY NEW YORK ZOOLOGICAL SOCIETY.

FEEDING A BABY TIGER ON MILK OUT OF A BOTTLE AT THE NEW YORK ZOO.

A PICNIC PARTY ON THE VOLCANO OF KILAUEA SCORCHING POSTAL CARDS OVER CRACKS IN THE ROCKS.

TO CREATE A VOLCANIC PARK

By

KATHERINE LOUISE SMITH

NOT content with creating national parks in the United States Uncle Sam is now turning to his dependencies, and the latest plan is to create a national park around the volcano of Kilauea on the beautiful island of Hawaii. This is the largest active volcano known and strange to say one of the safest and most accessible.

The proposal has been long discussed and has recently taken definite form. Surveys have been made of two tracts around this crater and around the crater of Moana Loa and there is every prospect that these will comprise a new and novel nationai monument. The district is peculiar, being largely composed of deep picturesque pit craters, sulphur banks, lava trees and wonderful ferns and verdure, all of which will lend additional interest. Part of the ground is public land, other tracts are owned by private parties but as these have signified their willingness to dispose of their holdings, Hawaii, "the loveliest fleet of islands that lie anchored in any ocean," will probably have an added attraction for the tourist.

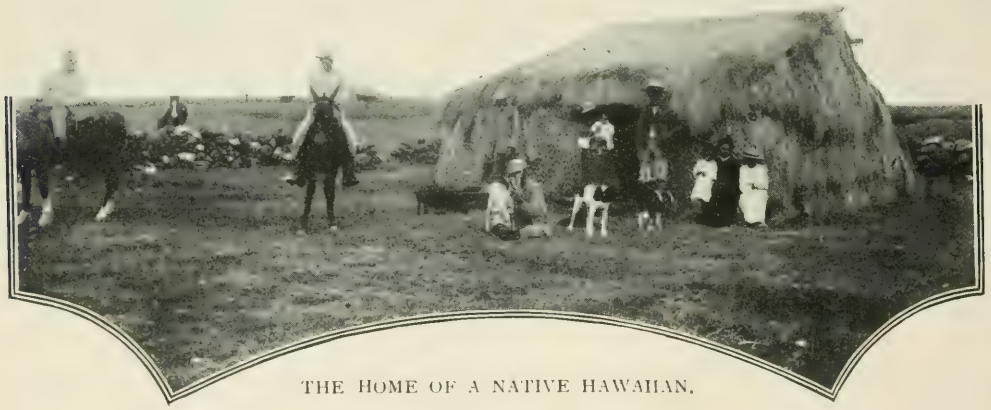
In these and other volcanoes, Hawaii possesses wonders that for awe-inspiring grandeur eclipse anything in the western world. Thousands of persons take long

pilgrimages every year to the crater of Kilauea and stand before one of the most stupendous spectacles within the ken of man and as this volcano has been continuously active as far back as history goes they are never disappointed in its phenomena. What is equally unusual is that the journey is an easy one. It is possible to ride up the mountain slopes in a parlor car to within nine miles of the crater and to go from there in automobile or carriage over a well built road, which runs through tropical forests of luxuriant green. There is no weary pilgrimage, no climbing that is so strenuous that the traveler wishes he had never attempted to see an erupting volcano. There seems no end to wonders for one may stand on the very brink of this living volcano and look into a lake like molten lava, or he may be fortunate enough to witness great fire fountains that rise and fall in an awe inspiring fluid mass.

Though volcano activity exists all through the islands in various forms it is especially noticeable in the two principal mountains. Kilauea is situated at an elevation of four thousand feet on the belt road around the island and on the slope of Moana Loa which is fourteen thousand feet high. It is proposed to include both craters in the park.

Moana Loa and Kilauea are both remarkable volcanoes but as the former only erupts occasionally the latter holds the palm for popularity. This fiery mountain always satisfies for it not only furnishes spectacular amusement the year round but the temperature seldom rises above eighty degrees at midday and the nights are so cool that wraps are in demand. Though Hawaii is today considered the world's youngest land, being only a few hundred thousand years old, it can show remarkable phenomena for it has live and dead craters, great valleys, immense precipices, and strange conformations that equal any country in the world. The crater of Kilauea, which by its peculiar formation can be approached to the edge, is said to be the safety valve of the Pacific though it is called by the natives the "Home of Everlasting Fire."

In reality, it is an immense pit. The crater is about seven and three-fourths miles in circumference with an area of four and a half square miles. Its depth is six hundred feet below the lava plain. One can approach with safety within a few rods though the inner lava pit has on occasions been known to overflow and to spread over the floor of the main crater. "Can you imagine standing on the brink of a precipice six hundred feet high, which is really the walls of a great pit the opposite side of which rises three or four mile in front of you?" asks a volcano enthusiast. "If so, you will get some hint of the size of this crater but you must also picture a black lava floor that looks like a vast sea." Fortunately the lava has been cold for years so one can traverse it and finally reach the wonder of all—the Home of Everlasting Fire —in the language of the natives—Halemaumau." It is here that no one, not even a wondersmith in words, can adequately picture. The great lake of molten lava quivers, surges and roars and the whole is a scene of terrific grandeur.



THE HOME OF A NATIVE HAWAIIAN.

MINING COAL IN THE ARCTIC

By

DR. ALFRED GRADENWITZ

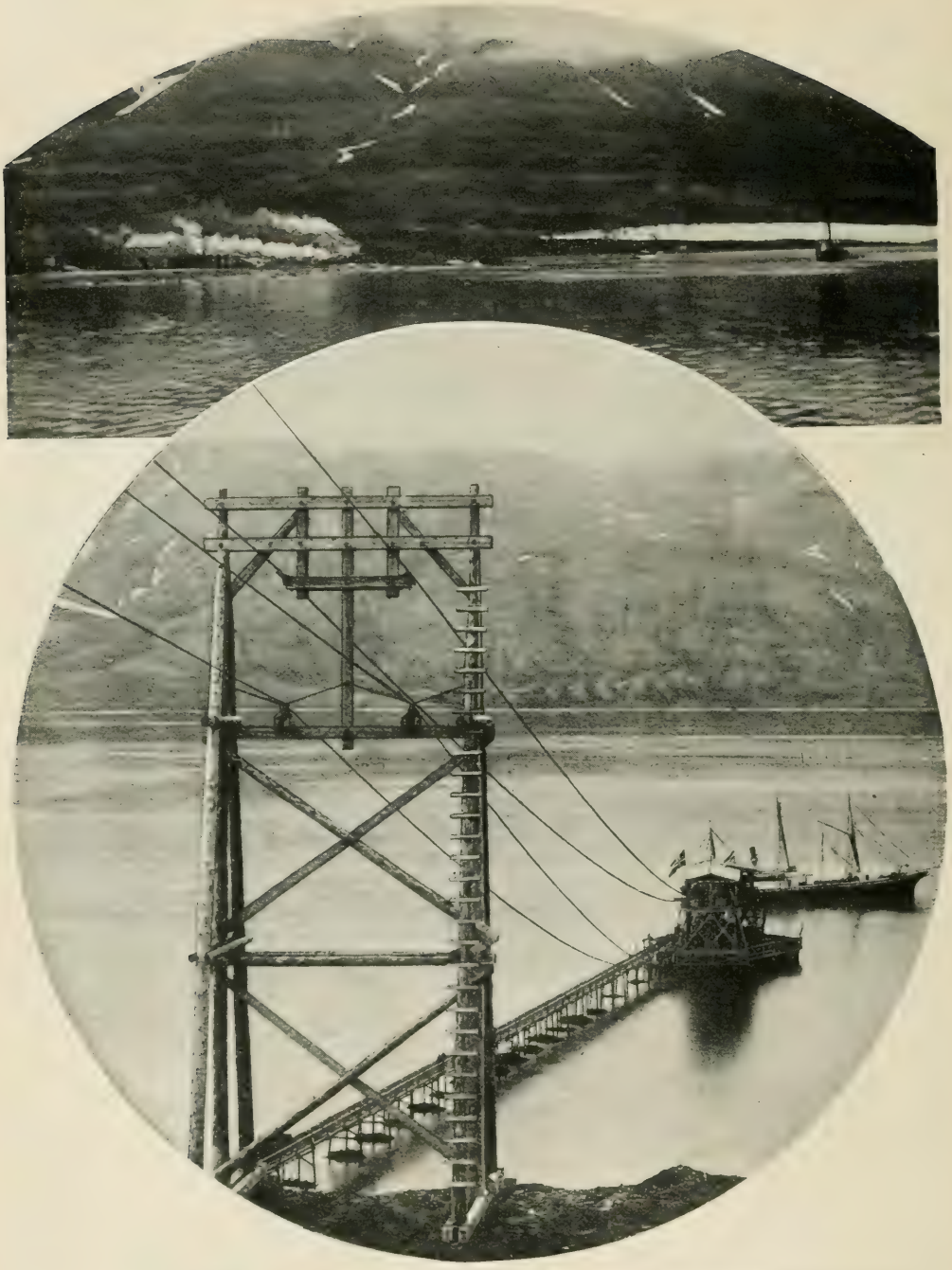
SPITZBERGEN was not always the barren, uninhabited country it is known to be at present. For several centuries it formed the center of a whale and walrus fishing industry, to the proceeds of which the Dutch are indebted for part of their wealth, and not before human greed had nearly exterminated the whale and driven the reindeer into the interior of the country were the once flourishing summer settlements of Spitzbergen definitely abandoned.

However, this group of Arctic islands is again finding increasing interest, as the goal of tourists who, without fatigue or danger, on a comfortable trip of some weeks, wish to experience all the sensations of North Pole travel, and on account of the coal deposits recently discovered in the country. In fact, the big shipping companies are every summer sending out their steamships to Spitzbergen, while the meteorological stations founded by Professor Hergesell are promoting scientific investigation, and the principal nations are vying with one another in opening up the coal treasures of that country placed under nobody's rule.

An American mining concern, in opposition to its competitors, has from the very beginning chosen the right way by carrying on operation all the year round without any break in winter. This is how Spitzbergen has come to be inhabited even in winter by about two hundred miners, who spend the long polar night on the island.

Special requirements had of course to be complied with in view of the unusual climate. As during the eight or nine winter months there is no possibility of carrying on shipping, the coal dug in winter had to be dumped on a waste-heap, in order during the short summer, when Advent Bay is free from ice, that it might be carried away, together with the summer output. This is why some means of transport had to be chosen which, in addition to complying with these requirements, might allow the ships anchored at six hundred to one thousand feet from the coast to be reached without any transfer of the coal. As the mine is situated near the coast at about 650 feet above sea level, a track cableway could have been used to take the coal to the sea coast, in order thence to be transported by barges on board ship. However, such a plant on account of the Arctic snow and ice, would have been out of operation during the winter season. Moreover, the double transport into barges and thence into ships would have retained too long the ships waiting to be loaded, while every workman brought over from Norway would have entailed the investment of a considerable sum, thus making the whole operation unnecessarily expensive. The company therefore decided on using a cableway which even in winter is in full working order regardless of weather conditions, and allows the ships to be reached directly from the coast, and the industry to go on uninterruptedly.

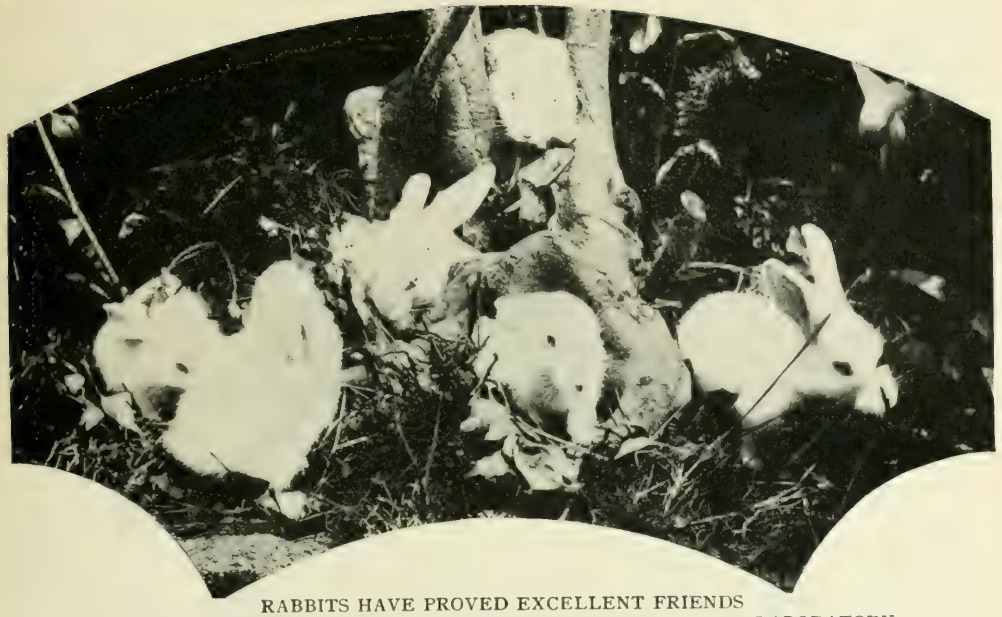
This cableway is about four thousand feet in length and, from the mine to the sea, overcomes a level difference of 650 feet. Its hourly output is one hundred tons, which in winter is dumped on the open track near the coast. In summer the coal is taken to the terminal station in the sea, in order there to be dumped into ship-holds by tipping the trucks. Simultaneously with the summer output, the winter coal is dealt with in summer, by means of a track railway, leading over a narrow pier as far as the terminal station of the cableway, where the trucks



GREEN HARBOR, AND THE CABLE FOR CARRYING COAL AT ADVENT BAY, SPITZBERGEN.

of the track-cableway are likewise tipped into ships.

The cableway runs without any hitch in summer and winter, only requiring some superintendence at the pit mouth—for transferring the coal from hoppers into cableway trucks—and works with an automatic braking regulator.



RABBITS HAVE PROVED EXCELLENT FRIENDS
OF THE BACTERIOLOGISTS IN MAKING EXPERIMENTS IN THE LABORATORY.

NEW PUZZLE IN MEDICINE

By

HENRY SHELDON

SMITH was visiting over-night with Jones at the latter's home in the suburbs and among other things that were served for breakfast the next morning were poached eggs. Smith ate two of them with apparent relish. Half an hour later the host found his guest on the veranda, looking positively ill.

"Oh, it's nothing much," Smith explained dejectedly, "I guess the eggs made me sick."

"But my goodness, man," exclaimed Jones excitedly, "they were laid only yesterday!" He felt very properly indignant, too, for his poultry were his pride and his chief reason for living on the outskirts of the city.

"It wasn't the fault of your eggs," feebly apologized Smith; "I have no doubt that they were fresh enough; eggs always act that way with me. I ought to have known better than to eat them. It is one of my peculiarities."

Jones set down Smith's feelings and statement to a cranky fad and let it go at that. He thought Smith a funny sort of chap though, and his wife indignantly shared these sentiments.

But it wasn't an imaginary trouble on Smith's part—not at all. The eggs, undoubtedly as perfect and fresh as nature could produce, to this man's system were as so much poison. For a long time physicians have recognized the fact that certain foods, without any apparent cause, completely derange the digestive systems of certain individuals. As a matter of fact, we have long half-believed the old popular saying, "What is one man's meat is another man's poison." Medical science has recently given serious attention to this peculiarity and the official name that has been chosen for this condition is

anaphylaxsis, from the Greek phylaxsis, meaning, "prevention," and ana, meaning "against." Through this mysterious anaphylaxsis, strawberries are taboo to some, mutton to others, fish, in still other cases, will produce retching and great distress. The experiment has been made in several instances of so disguising the mutton, the fish, or whatever the offending food may chance to be, as to deceive the victim of this peculiarity. In all cases, however, the usual result manifests itself, proving conclusively that the stomach's aversion is not due to a finicky imagination.

A Great Scientist Declares That a Monument Ought to Be Erected to the Guinea Pig. Being remarkably susceptible to the influences of disease germs, experiments made with the guinea pig have proved invaluable.

Anaphylaxsis first received attention from the medical profession in a rather extraordinary way. Everyone of course knows of the wonderful cures that have resulted in certain germ diseases in recent years through the use of serums. Antitoxin for diphtheria is one of the first in point of time and conspicuousness of these. The serum product for the treatment of the terrible spinal-meningitis is likewise well known everywhere. There are various other serums used as specifics in various other virulent germ diseases.

One injection of a serum will not cure. It is necessary that a number of injections be made. Now here is the perplexing problem, for a long time inexplicable, that confronts physicians in the administering of these serums. Every now and then it happens that after the second, or in some rarer cases, possibly the third, injection is made, under the patient's skin or into his veins, the disease takes a markedly pronounced change for the worse and the patient dies. The enormously large number of cases, however, that have been brought back to health as a result of the use of these serums so greatly discounts the comparatively rare and isolated cases that seem to be rendered fatal by their use that no very serious scientific investigation has been made until recently as to the cause of this phenomenon. Indeed, physicians as a rule attributed this malevolent result to some impurity in the serum. Bacteriologists, working away patiently in their laboratories, becoming interested in these rare cases, took up the matter and began to experiment. Working with guinea pigs and rabbits, which are unusually susceptible to the influence of disease germs, the following remarkable theory for a serum's producing fatal results was deduced: The first dose—or doses—of the serum does no harm directly; it does however so change the condition of the patient's blood as to render fatal any subsequent injection of that same serum. In other words, the first doses pave the way so as to render subsequent injections poisonous. This, it must be distinctly borne in mind, holds true only in relatively few cases. Serums as a whole have been tremendously beneficial, and those persons who are subject to their poisonous influence—subject to anaphylaxsis—are, in a sense, oddities of nature, freaks. What is the cause of this, science so far has been unable to state. Medical men only know, at the present time, that it is so, though they are, as a matter of course, doing their best to try to discover the cause.

It was because of this same principle of anaphylaxsis that poor Smith was made ill by perfectly fresh eggs. The first eggs—theoretically, at least—that Smith ever ate should not have produced this effect. According to this hypothesis, the first eggs he ever consumed marked a vital change in his whole physical being.

Experimenting with the Flying Bicycle.

FLYERS WITHOUT MOTORS

THE question of aeroplanes or gliders without a motor to propel them is being taken up in France, and several inventors are at work upon this interesting problem. A stimulus has been given by a prize of two thousand dollars, which will be awarded to the first pilot who makes an official flight in an aeroplane without motor, the distance to be thirty feet. A forward and return flight is one of the conditions, and this will make it more difficult to gain the prize. Count de Puiseux is experimenting with what he calls a flying bicycle, and with the second flyer which he made he was able to cover more than two hundred feet, as he claims. On the bicycle are fixed four tubes which uphold the body of the machine, and this latter consists of a long bamboo frame of some fifteen feet length. In front will be seen the helix of three feet six inches diameter. To this body are fixed two wings so as to form the flying surface, and they are made up of bamboo and heavy canvas, with a total surface of 35 square feet. Steel cables connect the wings with the main body so as to brace the whole. In the rear is a steadying plane or rudder. The pilot mounts the bicycle and works the pedals, and these are connected to the helice so that the pedal movement drives the helice, and this serves in turn to propel the bicycle itself by the drive of the helice. The bicycle carries a pulley on the rear wheel which is connected by belt with the helix so as to drive it in this way. Another curious bicycle flyer which is being experimented with is that of M. Ladougne, but unlike the one we have just mentioned, it does not carry a helix and is intended for short flights. The bicycle is of the usual kind, except that it has a canvas covering on the front wheel so that it can take the place of a rudder for steering the flight when in the air. This is a flyer which almost any amateur could make up. The flying surface is a single piece and four light steel tubes connect it to the bicycle frame. Another machine is the Chauvière "planeur," this being of a more elaborate construction and has a front and rear flying frame. As there is no helix used, the flight must be made standing from an elevated point. The spread of the front surface is thirty-one feet and for the rear part fifteen feet, and the entire length is about twenty feet. In using this machine it is necessary the pilot takes hold of the frame in his flight, and he keeps in about an upright position. From these three instances it will be seen that the inventors have quite different ideas about the make-up of a motorless flyer.

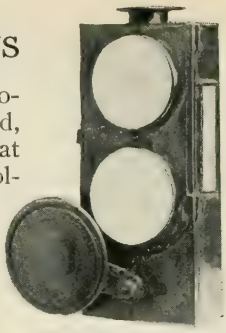
Count de Puiseux.

The Flying Bicycle Getting Under Way.

SIGNAL TO PREVENT REAR END COLLISIONS

A NEW tail light for automobiles has been invented, which should prove of great value in preventing rear end collisions, such as are often caused by the sudden stopping or turning of the car ahead. This automobile safety lamp is a combination of three lights: the regulation red tail light above, a white light at the side to show license number, and a lower light with a green glass that is covered by a metal shutter. When a sudden stop is made or when the car is about to turn, the green light is exposed by an electric device connected with the brake. Another style of the lamp, which burns oil, is operated by a cable instead of electricity. Very slight pressure is required to shift the shutter off and on, and in case of an emergency, it would be instantly operated. Signaling with the hand would be difficult, especially from a closed car, and has the additional disadvantage of taking a hand from the clutch just when it is needed.

This new invention is of a character that will probably appeal to all thoughtful people who wish to make the business of motoring as safe as it is possible to make it.



SHUTTER OPEN MEANS: "GOING TO STOP."

SHUTTER CLOSED SHOWS REGULATION TAIL LIGHT.

REMARKABLE GROUP OF SPOONBILL FISHES

THE American spoonbill, *Polyodon spathula,* which is rapidly being exterminated by the fishermen, is here reproduced in a realistic group. It represents a school of these large fishes swinging around into the seine of the fisherman; another ganoid, the garpike, appears at the left poised high in characteristic position, while below are catfish, carps, perches, herrings and drumfish.

The group gives a comprehensive picture of the fish life of the lower Mississippi. The spoonbill is caught in seines in large numbers and highly valued for the caviare. When this is shipped away from the lower Mississippi, a jet black mass of shiny, gelatinous globules, the kegs in which it is packed are labelled "sturgeon roe." By the time the product has reached its destination and is served in a New York, Chicago, London or Paris restaurant it has become "Russian caviare."

The sturgeon lives in the stretches of the Mississippi in enormous numbers, but it was not until about two years ago that Mississippi fishermen took up roe gathering as a side line. They have found it immensely profitable, and the

A SPOONBILL STURGEON GROUP.
This group is an achievement in both science and art.

industry is growing fast.

A quarter million pounds of roe is probably a low estimate of the total yield last year. A good deal of it was shipped abroad, as Americans have not acquired the caviare habit to the same extent as the people of a number of European countries.

The sturgeon of the Mississippi is enormously prolific. Three million eggs is about the average production of a female in a season. Not infrequently one-third of the weight of a sturgeon is found to be roe.

THE INDIAN ARTIST, JESUS CASTRO.

INDIAN DOES RARE ART WORK

JESUS CASTRO, descendant of the famous Toltec tribe of Mexico, proves, beyond all doubt, the great artistic ability possessed by his tribe.

The majority think of any Indian as a semi-savage—even those educated in the white man's schools are looked upon as some way "different" from the rest of mankind, and to such, Castro and his art is almost beyond comprehension. Tall and splendidly built he is a type of perfect manhood. His hair—softly silkily black falls in natural waves around a face classic as that of an olden God.

He speaks the pure Castilian with a perfect accent, the delight of scholars from various noted colleges.

Without a single hour of instruction Castro paints exquisitely—draws from life with the adeptness of an "old timer" and—what caused the most wonderment, cuts from paper—beautiful scenes—landscapes and figures. This is done with a small pair of manicure scissors and without any effort on his part.

SCENE CUT FROM PAPER WITH A PAIR OF SCISSORS.

Gentle and refined — his manner makes him the center of attraction in a gathering and while courteous to all—he is friendly to only a small few.

He has had offers from managers at large sums to travel and cut for them but refused them all to remain in the

THE MAN HUNT—ANOTHER EXAMPLE OF JESUS CASTRO'S ART.

TURTLES' HEADS AS BIG AS A HUMAN SKULL.

army and help his beloved country. His cut pictures command large prices—but most of the proceeds he gives to the less fortunate. The elite open their homes to him and shower him with attentions, yet he remains unaffected and charming in his manner.

He is a true artist—a type of the sort that one may not meet with once in a lifetime.

HUGE TURTLE HEADS

THE accompanying photo of the skulls of two large alligator snapping turtles compared with that of a human being, indicates the enormous size occasionally attained by this reptile. This species is easily the largest of the fresh-water turtles. It is quite common in the Mississippi river basin from Missouri southward, and ranges from Texas to Florida.

The head is armed with keen edged mandibles, terminating above and below in a sharp beak. The damage these jaws are capable of inflicting is serious indeed. Fortunately, however, as is the case with most other dangerous reptiles, he only fights when cornered.

Alligator snapping turtles lay their eggs in June and at this time are often seen either quietly occupied with their domestic affairs, or if alarmed, plunging headlong down the slippery bank to escape in the water.

The larger of the two skulls pictured, has a circumference of twenty-four inches, which indicates that the turtle must have weighed close to 150 pounds. These specimens were taken in fish nets.

The snapping turtle is no friend of the fisher folk, as he does considerable damage—not only in eating much fish, but also in destroying the nets.

THE *Adamant*, A NEW TYPE OF WARSHIP.

This vessel, recently built for the British navy, is intended to be used as a depot for submarines, and is practically a floating workshop. She is not designed for a high rate of speed but merely to keep pace with the craft she is to serve. Hitherto, the depots for submarines have been semi-obsolete cruisers, so that, in this respect, a distinct step forward has been taken.

OLD BRIDGE BECOMES MODERN TYPE

By

HARRY F. KOHR

WITHIN a few hundred yards of each other at Kansas City are the oldest and the newest bridges across the Missouri River. Between them lies the story of forty years of progress in bridge building which has made the American bridge engineer the world leader in his profession. The old Hannibal Bridge, with its wooden panels and iron braces, marked an epoch in its day and stands yet—though twice rebuilt—a monument to the genius of Octave Chanute. The new Harlem Bridge, too, marks an epoch and likewise will stand for many generations a monument to its builder, embodying within its hugeness the triumph of an idea once hailed and then discarded, only to be revived again to become the accepted type for which the world was waiting.

A company representing railroad and packing interests acquired practically all of the land north of and across the Missouri River from Kansas City. These interests spent more than a million dollars building levees around this land to protect it from the river's overflow and in reclaiming a large area of land between the south bank of the river and the harbor line. The development of these lands required the building of a bridge across the river. Three big railroads were crowding the old single track Hannibal Bridge to the limit and the end of its usefulness was near. Interurban railroad systems were knocking insistently at Kansas City's front door. When that door was opened there would be a constant stream of trains and trolleys, motors and wagon traffic back and forth.

Engineers came from near and far, walked into the maze of engineering pitfalls and never were heard of again. A year, two years, three years went by and still no bridge. The railroads, the interurban promoters and the syndicate began to get uneasy. Was it possible that American engineering genius, admittedly superior to any in the world, was going to fall down on a problem like that?

THE INVENTOR OF THE LIFT BRIDGE—J. A. L. WADDELL.

Some twenty years ago, J. A. L. Waddell had patented a lift bridge designed to do away with the familiar swinging type. The first of these lift bridges, the Halsted Street Bridge, was built in Chicago in 1894. If you've had anything to do with Chicago bridges, you will remember

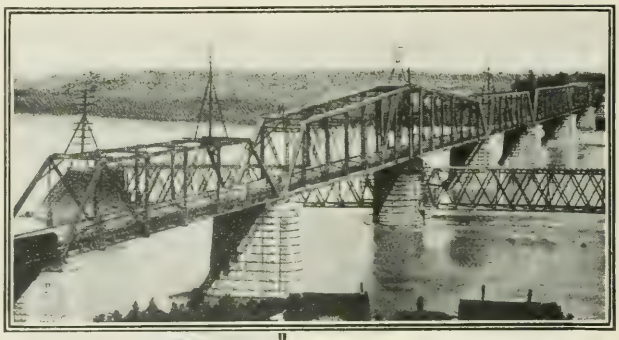
that the Halsted Street Bridge was for years the biggest joke in Chicago. It never worked when it had to be lifted and when it was lifted it was always a matter of doubt whether it ever would come down again.

Naturally the lift bridge, as exemplified in the Halsted Street trouble maker, got into bad repute and nobody would have anything to do with it. Engineers called it a failure. But Waddell wouldn't be convinced of that. If the bridge had been built, equipped and operated as he planned it should be, it would work like clockwork, he declared. Finally he prevailed on the Chicago authorities to replace the old steam lifting engines with electric motors, trim up the counterweights, put the bridge in the balance and put competent bridge tenders on the job. As a result of this advice being followed ever since the bridge has worked like a Swiss watch. The Halsted Street Bridge ceased to be the biggest joke in Chicago and became, instead, the forerunner of a type of bridge that has revolutionized bridge building in the United States.

Meantime Waddell had formed a partnership with John L. Harrington.

About the time that Waddell had straightened out the kinks in the troublesome Halsted Street Bridge, F. W. Fratt of Chicago became the president of the Kansas City syndicate. Fratt had taken some interest in the Halsted Street Bridge, and when his directors put up to him the problem of solving the bridge problem at Kansas City he saw the possibility of applying the same principle to the Kansas City bridge problem. So he called in Waddell and his partner, John L. Harrington, and outlined to them the company's plans for the Kansas City bridge.

So the two engineers,



THE OLD CHANUTE BRIDGE AT KANSAS CITY, WHICH WAS REBUILT THREE TIMES.

THE NEW LIFT BRIDGE AT KANSAS CITY, CLOSED.

THE BRIDGE PARTLY OPEN—OR LIFTED—TO PERMIT A STEAMBOAT TO PASS.

WHAT MAY BE DONE WITH THE LIFT BRIDGE.
The one shown in this illustration stands at Portland, Oregon.

Waddell and Harrington, set to work to show them, to make a model of that new-fangled channel span. It was to be a real working model, one that would demonstrate to the most incredulous the practicability of the plan.

"Spare no expense," said the directors, "but make it the real thing."

When it was finished the directors gazed in wonder at the toy. The entire model was seventy feet long and eighteen feet high, trimmed to a hair's breadth of one-fifteenth of the size and to a feather's heft of one-thousandth of the weight of the actual bridge span. Every rope, wheel, motor and weight was in exact proportion. The folding deck weighed 1,500 pounds, and across it ran a heavily loaded miniature train. All the machinery was especially cast. The girders and trusses were made of wood joined with iron plates and the counter-weights were of concrete. This toy cost $1,500, but it convinced the men with the money that the engineers hadn't been dreaming any idle dreams. Engineers from all over the country flocked to see the model and study it. When it had served its purpose it was sold for $35 for junk.

But there still was another problem to be worked out. The engineer must know in actual practice the action of cables used to lift the folding section upon the sheaves over which they were to run. Another model was needed to demonstrate this and a model span three hundred feet long was required to do it right. Again the feasibility and practicability of every idea was demonstrated.

But that wasn't all. In doing something new the engineers purposed to break a few records. They purposed to build the largest and heaviest steel structure west of the Mississippi River and give it the widest channel clearance ever given a movable bridge. They purposed to put into that same bridge two of the longest simple riveted truss spans ever built up to that time, which required in their building eight corner panels to be the heaviest single pieces of steel ever put into a bridge, not excepting the huge panels which went into the Quebec bridge and which gave away under the strain imposed upon them. These panels are seventy feet long and weigh 106 tons each, specially built cars being required to transport them. Complete the bridge cost close to $2,200,000.

With its approaches, the bridge is 4,150 feet long, the channel of the river being crossed by three spans, each 425.5 feet long, two of them simple trusses and the third a folding or telescoping lift span.

The lower deck is solely for railroad traffic. The upper deck is seventy-two feet wide, with double tracks in the center for interurban and local street car traffic, the roadway being of creosoted planks to permit its use also by motor cars. On either side are thirteen-foot roadways for vehicles and outside of these a footway for pedestrians. The roadways are paved with concrete. From low water level to the top of the folding span is 180 feet.

MOTOR TRUCK TO PULL UP TREES

THE motor truck is being put to a variety of uses these days, but it remained for a California orchardist to discover an altogether new use. Desiring to thin out the trees in his prune orchard, he hitched his truck to the body of the tree and with a good strong pull yanked the tree out of the ground without the aid of axe, grubbing hoe or block and tackle.

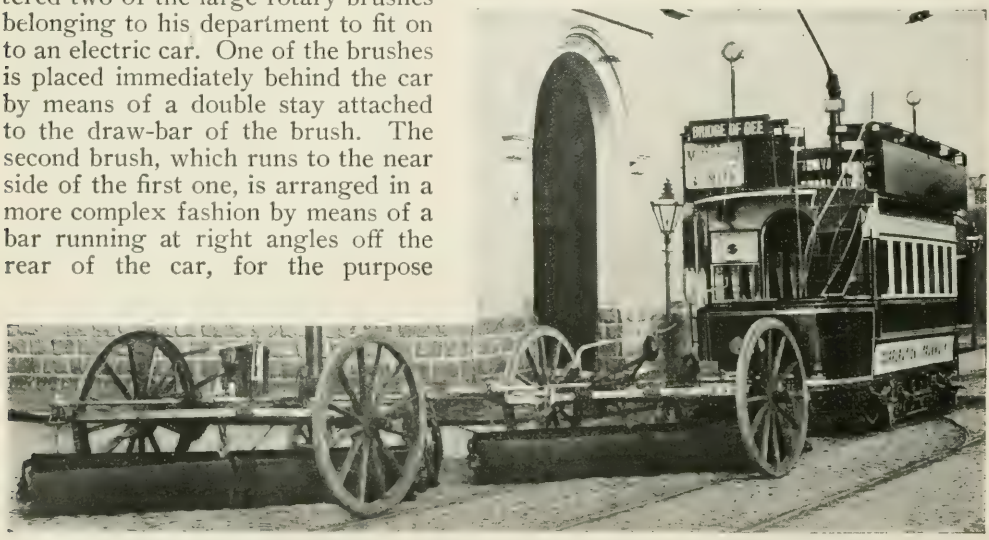
THE MOTOR TRUCK AT WORK PULLING UP A TREE.

STREET SWEEPING BY ELECTRIC TRACTION

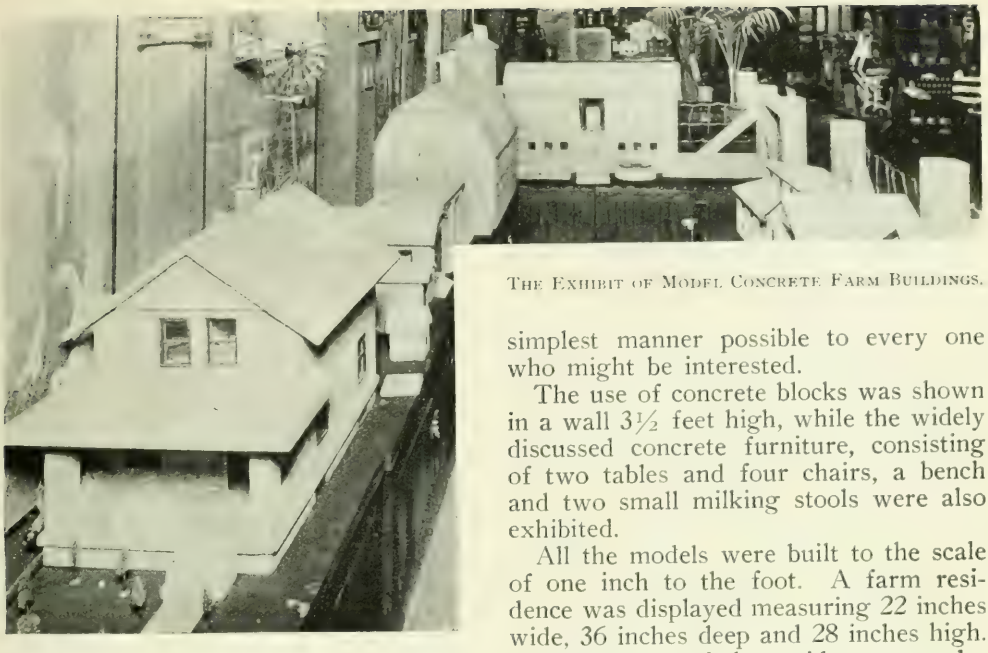
IN Aberdeen—the granite city of Great Britain—street sweeping is for the most part performed by electric traction. Mr. A. Findlay, the cleansing superintendent, who conceived the idea, altered two of the large rotary brushes belonging to his department to fit on to an electric car. One of the brushes is placed immediately behind the car by means of a double stay attached to the draw-bar of the brush. The second brush, which runs to the near side of the first one, is arranged in a more complex fashion by means of a bar running at right angles off the rear of the car, for the purpose of drawing and keeping it running straight. It is further controlled by a chain attached to the side of the bogie and another chain back to the stay at the rear of the first brush. In the case of narrow streets, or of obstruction in the thoroughfare, an arrangement has been made for reducing the width of the sweepers. The full width that the brushes will sweep is fourteen feet; but by the arrangement referred to, this can be reduced, when necessary, to any width down to seven feet.

The fixing arrangements are very simple and are applicable to either end of the car, as of course, the car cannot be turned. The brushes were not specially made for electric traction, but for horse haulage. They will clear to the side a two-inch fall of snow—that is, before it has been beaten down; the sweeping is exceedingly thorough, every particle of water being removed to the side of the street.

In Aberdeen they have two complete sets of such sweepers and have fourteen and one-half miles of double tramway track, nine miles of which is swept every morning, commencing at five and finishing at half past six. The remaining portion of the track is swept twice a week. The speed when sweeping is six miles an hour. The superintendent estimates the saving at half a dollar an hour per



STREET-SWEEPING BY ELECTRIC TRACTION IN ABERDEEN, SCOTLAND.



The Exhibit of Model Concrete Farm Buildings.

set of brushes and the work is, he claims, much better done than it could possibly be by horse haulage.

THE CORKSCREW TREE

A WINDSTORM of unusual violence played a strange prank with a tree in Los Angeles recently. Blowing with a gyratory motion, like a prairie cyclone, it caught the stem of the tree and whirled it around, leaving it twisted in a spiral as the photograph shows. The tree was formerly erect and fairly tall, but the twisting of its trunk caused it to collapse, although strangely enough the severe strain did not kill it or tear away any of its limbs.

MODEL CONCRETE FARM BUILDINGS

A SET of thirty models of all-cement farm buildings and miscellaneous structures for use upon the farm recently made a most interesting exhibit occupying about 400 square feet. The plan was to exhibit such concrete work as could be successfully constructed on the farm and to demonstrate it in the simplest manner possible to every one who might be interested.

The use of concrete blocks was shown in a wall 3½ feet high, while the widely discussed concrete furniture, consisting of two tables and four chairs, a bench and two small milking stools were also exhibited.

All the models were built to the scale of one inch to the foot. A farm residence was displayed measuring 22 inches wide, 36 inches deep and 28 inches high.

To the rear of the residence were located the following models in the order named: cistern, well-house, and wind

Tree Twisted by Storm into Corkscrew Shape.

mill, a dog house, smoke-house, ice-house, garage, carriage and wagon shed, horse and hay barn with watering trough adjoining, dairy, cow barn, with silo, and elevated water tank, circular watering trough and masonry base adjoining the concrete approach to the second story of the barn, which was intended to be utilized as a root cellar. Following these was a corn crib and granary and lastly a chicken house which completed the equipment.

The exhibit was first shown at the Chicago Cement show.

A Plymouth Capon and His Brood of Chicks.

CAPONS FOR RAISING CHICKS

IN the capon poultrymen have discovered the first male animal that will take good care of the young. In some cases he is even better than the hen for this purpose. He will scratch and cluck for the little ones and would half starve rather than take food from his young charges. Out in Kansas a poultryman hatched 635 chicks and gave them to capons which raised 600 of them—better results than could be expected from a hen or brooder.

Poultry experts state that before giving any chicks to a capon he should be put in a coop with a covered run and be left there for three or four days to get acquainted with his quarters. There should not be any roost in the coop. The capon must remain on the floor. After he gets acquainted with his surroundings, put the little chicks under him at night. Usually he will take to the chicks and look after them in good shape.

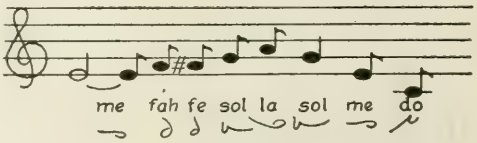
Sometimes the new mother will be found the next morning standing on one foot and trying to get away from the chicks. If this happens, the chicks should all be taken away and the capon confined in the coop and kept in the dark as much as possible. It very seldom happens that a capon will refuse the little chicks on the second night. In fact, it is frequently the case that the capon on his own volition will adopt young chicks without all this fuss, because he is a social outcast. He is pestered and fought by all the roosters on the place and shunned and snubbed by the hens. He is shy and unobstrusive, but he wants the society of others, so that there is no place for him to turn but to the little chicks. The little ones soon look on him as their protector and they will follow him about, wherever he goes.

TAKING DOWN MUSIC BY SHORTHAND

A NEW way has been discovered of recording music, though to do so one must not only know music but shorthand as well. Suppose one hears a new piece of music at a public place, that is not listed on the program—an encore, for instance. The only way of finding out the name of the piece is to carry it in the mind until the next day, when it can be hummed over to the music dealer. This method is very uncertain, however, as memory is a treacherous thing.

Suppose the air that it was desired should be remembered was "Gee, I Wish That I Had a Girl," the popular ragtime piece of a few years back. The system, in this particular case, would then work out in this fashion. Imagine that the air was written in the key of C, and that the first note is "e," or "me" according to the "do, ra, me, fah" system of our schooldays. After recognizing the notes by ear, it is simple to write them in shorthand, and the time, or half notes, whole notes, etc., may be indicated by spaces between the shorthand lines.

According to this method, the following diagram is the way "Gee, I Wish That I Had a Girl" would be recorded:



A NEW RANGE FINDER

THE accompanying photo conveys a fair idea of the appearance of a new range finder, at present used in the British army and recently tested by officers of the United States army, with the view of determining what advantages, if any, it possesses over the present instrument as used by our own government.

The arrangement is such that the combined telescopes may be simultaneously

directed on the same target, the range finder forming the base of the triangle, having at its vertex the object, the range of which is determined by measuring the parallax. To make an observation, the observer grasps the handles and directs the instrument toward the object whose distance is to be ascertained, holding the range finder horizontal with the line of object. In the right eye piece are placed two mirrors separated by an extremely narrow horizontal line. Supposing the object to be a flag staff, the picture presented to the observer will be that of a broken column, the upper part of which has been moved to the left. In the case of looking at a tall building, the picture resembles one brick overlapping another.

The next procedure is to bring these broken lines into plumb, which is accomplished by a large screw having a milled head placed near the tripod head and so

Ingenious Toe Device for Rocking Baby's Cradle.

situated that it may be operated by the thumb and forefinger of the right hand while grasping the handle. The screw when turned to the right, causes the upper half of the image to move to the left and its parts to separate. When the screw is turned to the left, the two halves of the image are brought together so that the perpendicular lines coincide at the dividing horizontal line and all distortion disappears. Then the correct distance may be read through the left eye piece, where a series of figures in yards appear on the surface of a wide disk, the scale having moved according to the direction in which the operating screw head was turned. The correct range, therefore, always depends upon bringing the halves of the image into exact alignment at the line separating the two mirrors.

Using the New Range Finder in the United States Army.

INGENIOUS CRADLE DEVICE

PROBABLY the most primitive cradle rocking device ever seen or employed in any part of the world is the one here pictured. This novel method has been adapted by the matter-of-fact squaws of the Kwakuitl tribe of Indians now living on Vancouver Island, British Columbia. A great deal of their time when not engaged with household duties is spent in weaving, making mats, baskets and some parts of wearing apparel out of the fine inner bark of a certain cedar tree, a very serviceable and waterproof fabric being obtained out of this material. The picture shows a Kwakuitl mother performing the double duty of spinning and rocking her infant snugly packed in a hollowed-out cradle stuffed with cedar bark strips suspended from the limb of a sapling. This is about the most realistic and accurate representation of the old nursery song, "Rock a bye Baby, in the Treetop," so far known, the most striking part, however, being that of the Indian mother using her big toe as the motive power, with a cord attached to the bent limb and the other end wound around her toe, she swings her dangling offspring to and fro, leaving her hands entirely free for weaving. So out of the ordinary was this scene of Indian life that a life-size group of this subject has just been set up in the North Ethnological Hall of the American Museum of Natural History, New York.

TO STUDY THE BREATHING OF FRUITS

By

RENÉ BACHE

THE recent construction of an outfit for studying the breathing of fruits and vegetables, at the Department of Agriculture in Washington, has had for its object an inquiry into matters of utmost practical importance from a commercial point of view.

Even the fact that vegetables and fruits do breathe after being gathered for market is unknown to nearly everybody. The green tomato reddens and ripens in the sunny kitchen window, and the apple in the cellar mellows, not because they are undergoing chemical changes, but for the reason that they are alive, and processes like those of ordinary ripening are going on in them.

In the meantime they are taking up oxygen from the air, and giving out carbonic acid gas and water vapor—or, in other words, are breathing. Furthermore, they produce heat as a result of the work which goes on in their cells. All of these processes are much like those which go on in the bodies of animals.

It is very important to find out everything possible about these processes, because an exact knowledge of them has an obvious usefulness in the correct development of those methods of storage and transportation which in these days bring the fruits and vegetables of summer to the consumer at all seasons of the year. Such methods involve special systems of growing the crops, and ways of handling and marketing them very different from those adopted when the products in question are to be used within a few miles of the garden or orchard, and within a few hours or a few days after they are gathered.

It appears, then, that whereas hitherto the business of storing and transporting vegetables and fruits has been conducted on a purely "empirical" basis—by doing, that is to say, whatever seemed, through experience, to produce best results, without the reason why being known—now the scientists are going to work to establish for it a rock bottom of exact knowledge. Much of such knowledge is expected to be gained by means of the outfit above mentioned, which has been newly installed at the Department of Agriculture, under the direction of Prof. C. Ford Langworthy.

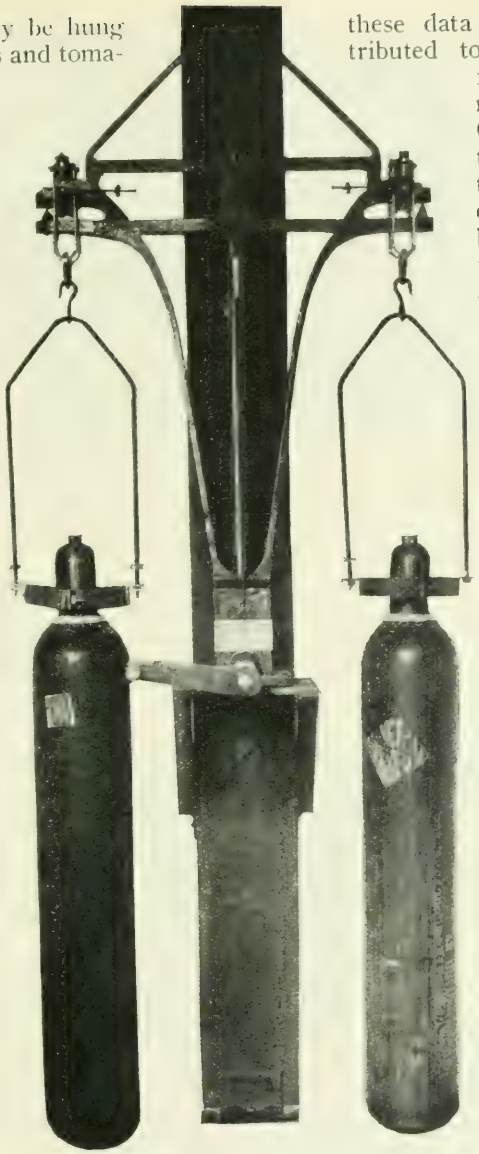
APPARATUS FOR MEASURING THE QUANTITY OF OXYGEN IN THE AIR THAT COMES OUT OF THE BOX FOR STUDYING THE BREATHING OF FRUITS AND VEGETABLES.

The apparatus is an insulated box, with a double wall, inside of which the vegetables or fruits are placed. A

bunch of bananas may be hung from the top, or apples and tomatoes placed on shelves running around the inside. Connected with the box is an arrangement by which a current of air is kept continually flowing through it. That is to say, it is always the same air, but a sufficient quantity of fresh oxygen is supplied to replace what the fruits or vegetables take up in breathing, and the carbonic acid and surplus moisture are thrown out (these being respiration products) by passing the air through chemical substances.

The box is called a "calorimeter," and is merely a miniature of the kind of apparatus used during recent years for making studies of the vital processes of human beings—a man in the latter case, instead of a bunch of bananas, being shut up inside. Where the man was concerned, one of the important things to be measured was the amount of heat given off by his body; and the same thing is done in regard to the vegetables or fruits, and in the same way—that is to say, by taking up the heat in a current of cool water which flows through a metal pipe coiled around the upper part of the inner walls of the box.

The amount of heat is determined by measuring the temperature of the water as it enters and leaves the pipe, and by measuring the quantity of water which passes through in a given time. From these data the total heat contributed to the water by the fruits or vegetables is readily computed. Gain or loss of heat through the walls of the box (which are of copper) is prevented by keeping the two walls always at the same temperature.



Balance for Weighing Oxygen Supplied to the Air in the Box.

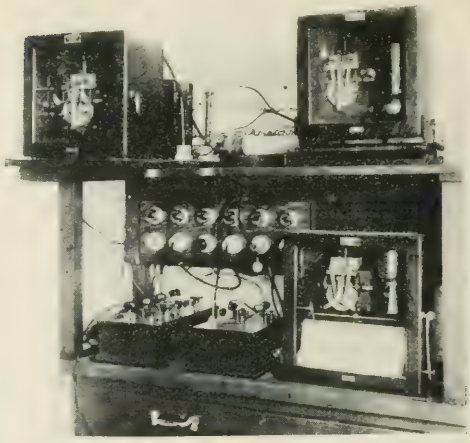
Under such a condition of equilibrium of temperature, heat cannot pass from the outside into the box, or from the inside out.

Now, it is quite a recent discovery that warmth and sunlight, which develop color, flavor, and texture of ripening fruits, do this, very largely at least, because they favor the action of the "enzyms" that bring about these changes. On the other hand, low temperature and absence of sunlight are useful in storing and transporting vegetables and fruits for the reason that they hinder the action of the "enzyms," and thus retard the ripening processes.

But what are the "enzyms"? The answer is that nobody knows exactly what they are, but merely that they exist and that they do certain things, being extremely important in the affairs of nature. To use a figure of speech, they are built up like houses of toy blocks, so that the slightest push tumbles them to pieces. When the chemist tries to isolate them, they change in such a way that he cannot tell what he had to start with.

The action of "enzyms" is stimulated

by heat, and thus fruit in a warm place ripens faster. It is retarded by cold—a fact which is the basis of the whole cold storage industry. Potatoes improve in quality up to a certain time after they have been dug out of the ground, developing flavor. This is due to "enzyms." The same thing happens, owing to the same cause, in the case of wheat, which makes better flour after being kept for a while.



Contrivances for Controlling and Recording Temperature and Other Conditions Inside the Box, from the Outside.

The processes of "curing" tea are merely empirical methods adopted for securing certain enzymic changes. It is the same way with tobacco. Dried tobacco leaves are not tobacco, in the commercial sense of the word. Nor, indeed, is dried grass hay—a distinctive attribute of which is its aroma. Hay is the result of a curing process, in which certain changes are produced by "enzyms."

The "ripening" of cheese, productive of desirable flavors, is accomplished by "enzyms." And so likewise do meats depend upon these microscopic "ferments" for improvement of their quality while "hung." It is, in short, an immense field that is covered by this new knowledge—a knowledge of vast commercial importance, inasmuch as it signifies exact control by man over natural processes which hitherto have been very imperfectly understood. Up to the present time, in dealing with food products of all sorts, we have been working in the dark; now we want certainties, and we are going to get them. It is a great step forward.

The calorimeter box at the Department of Agriculture is designed to accommodate one good-sized bunch of bananas, suspended from the top; and brackets have been attached at different levels, so that trays, shelves, or other supports may be used for sweet potatoes, peaches, or whatever other vegetables and fruits may be under experimental study. Such material may be packed in the chamber, if desired, just as it is in cold storage warehouses, with a view to approximating commercial conditions. Two small windows on opposite sides of the box enable those in charge to view the entire contents—the interior being illuminated by an electric lamp.

Double-Walled Copper "Calorimeter" Box. The fruits and vegetables are placed inside of this.

With slight modification of the apparatus, it can be utilized for studying the changes that take place in eggs while in storage, or in the curing and storing of meat products and cheese.

The application of the scientific principles thus discovered with the calorimeter box by the Department of Agriculture should prove of almost incalculable benefit to the fruit, meat, dairy farming, and, in fact, to all interests that are concerned, in the production of perishable food supplies.

The sciences of chemistry and physics are proving themselves, more and more, strictly worthy of the respect of even the most utilitarian sort of people,—of those who ignore whatever has no direct bearing upon the means of obtaining a livelihood.

Even in the kitchen, the science of chemistry is being treated with due respect. It would seem as if science were directing the greater part of its energies nowadays to the proper aliment of mankind, for so long, through the ages, woefully neglected.

WHERE THE EARTH IS LITERALLY COVERED WITH EGGS.

TOO MANY EGGS

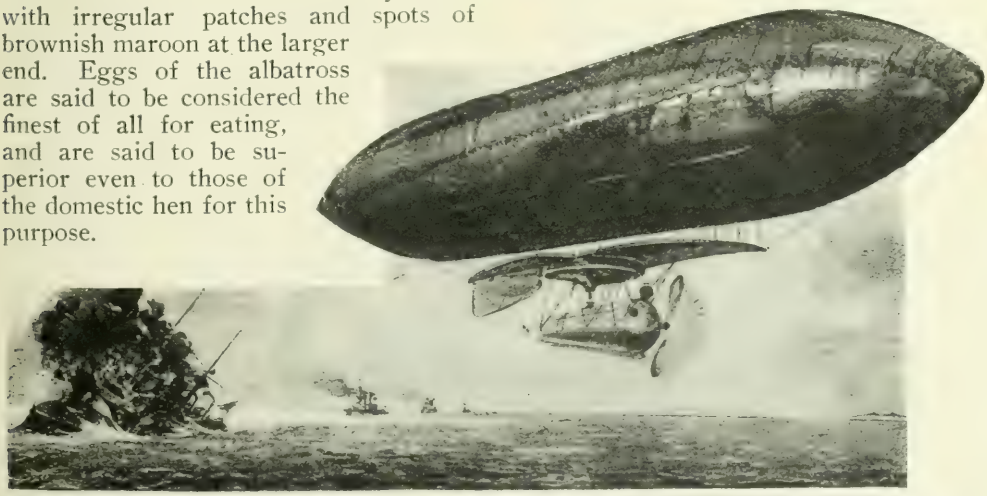
LAYSAN, in the Hawaiian Islands, is one of the most remarkable bird islands in the world. Birds of various kinds flock there yearly, among them being the albatross, which arrives the latter part of October and remains till the following August. The white albatross lays one egg, usually on the ground. The eggs vary in shape and coloration. Some are long —length 111.5 mm., width 62.5 mm.—others short and very thick, in length about 100 mm., width 70 mm.

In color most of them are nearly white, with irregular patches and spots of brownish maroon at the larger end. Eggs of the albatross are said to be considered the finest of all for eating, and are said to be superior even to those of the domestic hen for this purpose.

BALLOON NACELLE TO ACT AS TORPEDO BOAT

THE idea for a new French airship is to have a nacelle which serves at the same time as a torpedo boat. When about to attack a battleship, the airship sails into view and comes down near the point of attack and the torpedo boat floats on the water. It then fires a torpedo against the vessel in order to sink it and is then ready to rise in the air and proceed to another point. The balloon part carries a large canvas-covered plane surface underneath it, and below this is

A. BRUYAS.

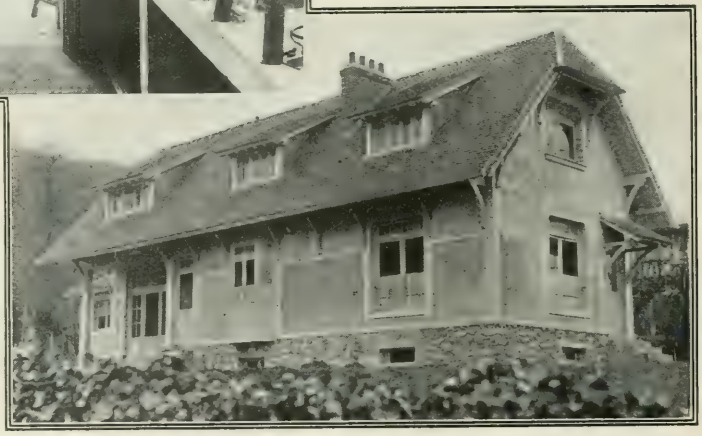


HOW A DIRIGIBLE WOULD ATTACK A BATTLESHIP, ACCORDING TO THE SYSTEM OF THE FRENCH INVENTOR, A. BRUYAS.

Chemical Laboratory of Gif Institute for the Study of the Science of Radio-Activity.

problems, and giving the physician new agents for the cure of diseases in the modern hospital.

While it is true there are other laboratories for research in radio-activity, these institutions are for scientific workers well schooled in mathematics, physics and chemistry, and they cannot undertake to test specimens of apparatus



The Library Building of the Gif Laboratory.

hung the combined nacelle and torpedo boat. It is all enclosed and built of light sheet metal, with a torpedo launching tube at one end and a helix at the other which serves for running in the air as well as in the water. The helix is mounted so as to act also as a rudder when submerged. As a new motor is used which is claimed to have no danger of setting fire to the gas, the nacelle can be brought well up near the balloon and used for propelling. It is proposed to build this airship soon.

TO STUDY RADIO-ACTIVITY

ALTHOUGH but a little over a decade old, the science of radio-activity has now a laboratory designed especially for technical work, and a publication devoted exclusively to this subject entitled "Le Radium" is issued in France. At this laboratory, the Gif laboratory, radio-active examinations are made of more than thirty radio-active elements.

The many new methods of research have increased the knowledge of the constitution of matter and the nature of electricity, aiding in the solution of various geological, meteorological and biological for physicians, factories or mining engineers.

Gif laboratory undertakes to make accurate tests of ores, products and apparatus, to give rapid and practical instruction in the knowledge and use of radio-active substances and apparatus, to contribute generally to the development of the theory and the practical applications of radio-activity, and to maintain a complete reference library on the subject.

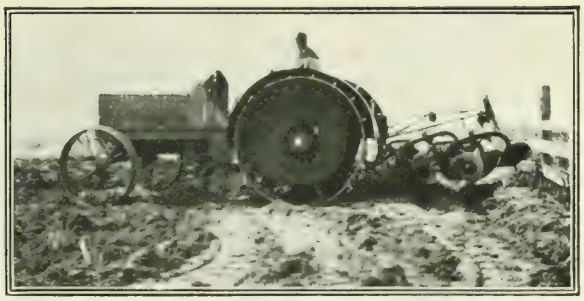
At this laboratory are five buildings. One building contains the testing rooms, research laboratories and collections, and has a terrace adapted for tests of meteorological apparatus and observation of atmospheric electricity and radio-activity.

In another building experiments are conducted with strongly radio-active substances. There are also a power building and shop equipped with forges, engines, dynamos and storage batteries and a library and office building.

GASOLINE AUTOMOBILE PLOW

A GASOLINE agricultural automobile that guides as easily as any automobile is on the market. The photograph shows the machine pulling four fourteen inch stubble plows up a fourteen per cent grade. It plows an acre per hour and requires only one man to operate it.

The gasoline engine utilized is of the heavy duty type with four cylinders.



GASOLINE-OPERATED AUTO FOR FARM WORK.

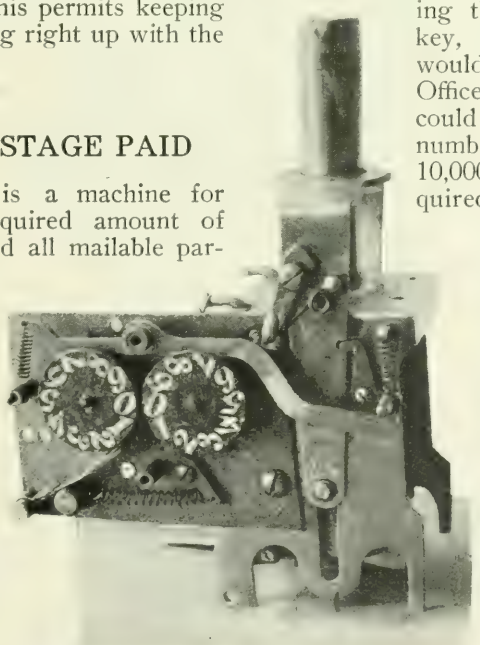
This tractor has two speeds, one for the field and a higher speed for the road, the change from one speed to the other being made almost instantly. The friction and reverse clutch is controlled by one lever and the belt pulley is detachable, it requiring but a few minutes to put it on or take it off.

All four wheels run on unplowed land, and it is claimed that with this tractor one can plow closer into the corner of a field than can be done with a team.

It is possible to finish up the "lands" at the ends, plowing across the ends out to the fence, as one goes along, thus finishing the field completely from one side to the other. This permits keeping the seeding or planting right up with the plows.

TO STAMP POSTAGE PAID

THIS new device is a machine for stamping the required amount of postage on letters and all mailable parcels. The primary object is to dispense with the use of adhesive postage stamps, which are usually licked, an unpleasant and insanitary custom, or else are moistened with a sponge, which is rather disagreeable to handle. The machine will effect economy if adopted by the Post Office Department, by saving the cost of engraving, paper, gum and perforating, while the user would save time and also a disagreeable sort of labor. Any one who has had to stamp thousands of letters or circulars will realize the advantage of a non-adhesive stamp. The machine consists of a stamping and indicating device, so constructed that each movement of the stamping apparatus is registered, showing the amount of imprints already used. Means are provided for locking the machine automatically, after a certain number of imprints have been made. The device is enclosed in a case having a lock and seal, and can only be re-set after breaking the seal and using a key, and this business would be entrusted to Post Office clerks. The clerk could set a machine for any number of imprints up to 10,000, and collect the required amount of postage, just as if he were selling so many stamps. The stamping device is of novel construction consisting of a vertical stamp, and an automatic self-inking device that applies the ink after each operation. It is very small and compact and could be easily carried in the pocket. Any denomination stamp could be placed in the machine while it is being re-set.



A MACHINE FOR IMPRINTING THE WORDS "POSTAGE PAID."

THE AIR ABOVE US

By

C. F. TOLLER

HARDLY was the sounding-balloon invented than its availability as a means of exploring the atmosphere was recognized; and in a desultory way it has been utilized for this purpose ever since. Until recently it was a case of Mahomet and the mountain. Since the upper air would not come to the meteorologist, the latter was constrained to travel to the upper air, an undertaking demanding a greater expenditure of time, energy and courage than could be reasonably expected of the average man of science.

Today the meteorologist performs these journeys vicariously. The personal scientific balloon ascent has become the exception. The process now forming part of the daily routine of a number of meteorological observatories all over the world is to attach a delicate self-recording instrument to the balloon and set it free. The balloon is so constructed as to burst at a great altitude. A parachute carries the apparatus gently to earth. This may happen hundreds of miles (horizontally) from the place of ascent; but a conspicuous label, attached to the balloon-basket, informs the finder that a reward will be paid for the return of the precious instrument. As a rule it comes safely home in the course of events. Then the meteorologist pursues at his leisure the fascinating story traced by the recording-pens—how high the balloon ascended, how warm and how moist the air was at various levels.

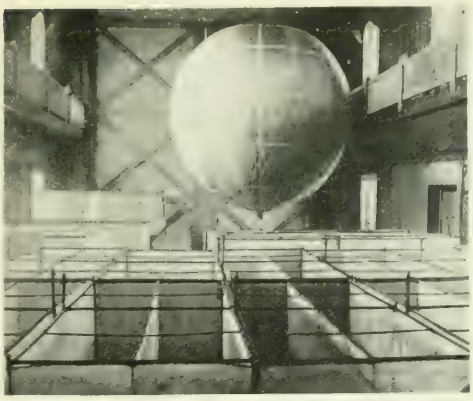
INFLATING A SOUNDING-BALLOON AT PAVIA, THE HEADQUARTERS OF UPPER AIR RESEARCH IN ITALY.

The "sounding-balloon"—as this type of apparatus is called—soars to heights unattainable by the human aeronaut. One of these balloons sent up by the United States Weather Bureau a few months ago reached an altitude of 18.9 miles—nearly 3½ times the height of Mt. Everest.

The most remarkable thing about the atmosphere at the great heights reached by the sounding-balloon is its temperature. The upper air is intensely cold; but not so cold as we used to think. In the year 1902 a number of sounding-balloons had been sent up in the neighborhood of Paris by a French meteorologist, M. Teisserenc de Bort. An examination of their records disclosed the curious fact that in every case, after an altitude of about 6½ miles was attained, the air stopped growing colder. Above that height the balloon passed through a stratum of nearly uniform temperature.

Meteorologists were quite unprepared for this discovery, and its announcement was received with considerable skepticism. Very soon, however, similar observations were reported from other parts of the world. Now we know that the phenomenon is not local or exceptional, but prevails everywhere. It appears that there is a layer of the atmos-

phere, just above the level of the higher clouds, in which there is little or no change of temperature in the vertical. This region was at first named the "isothermal layer," but is now more commonly called the "stratosphere." The height of its lower surface varies with a number of conditions, the most important of which is latitude. It is at least over the polar regions and greatest over the equator. This fact leads to a curious paradox. As our balloon goes up, the thermometer records a more or less steady fall in temperature; and the higher the stratosphere, the longer this fall continues. Hence the lowest temperatures are reached where the stratosphere is highest; i. e., within the tropics. In the year 1908 a sounding-balloon recorded 119 degrees below zero Fahrenheit about twelve miles above Victoria Nyanza, in the heart of Africa! This is the lowest temperature ever observed in the atmosphere.



BALLOON AND KITE HOUSE AT THE MOUNT WEATHER OBSERVATORY.

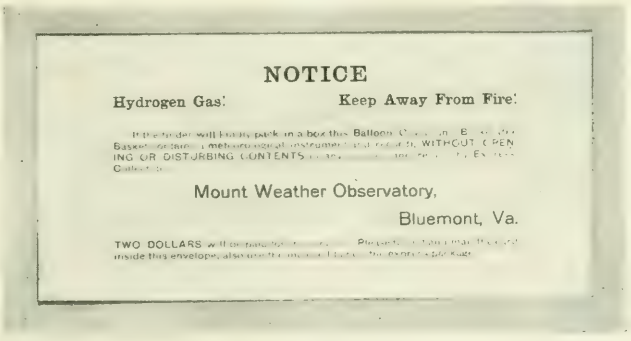
Cellular kites are used. The "string" is of steel piano wire, and is handled with a steam winch. This observatory holds the world's record for the highest kite flight—23,826 feet, on May 5, 1910.

The bottom layer of the atmosphere, extending from the earth's surface up to the stratosphere, has recently been named the "troposphere." Its exploration is accomplished by several methods.

One of the picturesque achievements of the new meteorology was to adapt an erstwhile toy, the kite, to scientific purposes. In its broader features the idea is, of course, not new. Everyone recalls how Franklin brought lightning from the clouds. But it is a far cry from the simple apparatus that served Franklin's purpose to the "box-kite" of modern meteorology. Science has perfected the kite almost beyond recognition. It has been shorn of that crucial feature of the schoolboy article, the tail. Even the kite "string" has become several miles of steel piano wire, wound around the drum of a powerful winch, with elaborate apparatus for recording the force of the pull, and the angles of azimuth and elevation. The metamorphosed kite is now, on the whole, the most dependable means of lifting meteorological instruments to moderate heights. Its "record" altitude, so far, is 4½ miles.

Two other aerial vehicles serve the meteorologist. The captive balloon replaces the kite in certain conditions of wind and weather. The "pilot balloon" is a cheap and simple device for gauging the upper winds. It carries no instruments; the meteorologist simply sets it free and observes its drift—usually with a theodolite.

Roughly speaking, the troposphere is seven miles deep. Three-fourths of the *mass* of the atmosphere is crowded within it. In other words, if we could weigh separately the troposphere



NOTICE

Hydrogen Gas! Keep Away From Fire!

... WITHOUT OPENING OR DISTURBING CONTENTS ...

Mount Weather Observatory,

Bluemont, Va.

TWO DOLLARS ...

THE KIND OF ENVELOPE THAT IS ATTACHED TO THE SOUNDING-BALLOONS SENT UP BY THE WEATHER BUREAU.

A remarkable feature of these balloon ascents is that the majority of the instruments and records are ultimately recovered and returned to the place of ascension—sometimes hundreds of miles distant.

THE KITE STATION ON THE SHORES OF LAKE CONSTANCE.

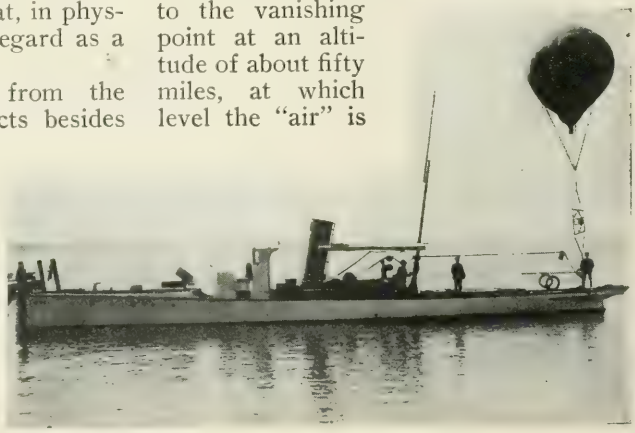
and the remainder of the atmosphere, extending hundreds of miles above it, we should find the former about three times as heavy as the latter. This follows from the fact that the air is highly compressible; relatively dense below and exceedingly tenuous above. At great heights its density is equivalent to what, in physical experiments, we should regard as a very excellent "vacuum."

The troposphere differs from the stratosphere in several respects besides temperature. All clouds consisting of water and ice occur within it. It contains practically all the moisture of the atmosphere. Lastly, it is the seat of all the great whirling commotions of the air that we know as "storms."

The stratosphere has its drifts and currents, but apparently no violent disturbances. Although it has no clouds, in the ordinary sense of the term, it has occasionally been invaded by masses of dust hurled aloft by volcanic eruptions. This happened during the great outburst of Krakatoa, in 1883. For several years thereafter the dust-clouds were seen shining with reflected sunlight through the short summer nights, and they were widely known as "the noctilucent clouds." Their altitude was estimated at about 50 miles. Similar clouds were seen after the eruption of Mont Pelé.

What lies above the stratosphere? Are there yet other layers of the atmosphere as distinct from the stratosphere and from each other as is the stratosphere from the troposphere? These questions carry us beyond the range of ascertained facts and into a realm of interesting speculation.

Near the earth's surface, "air" is always and everywhere very nearly uniform in its composition. Above the active circulation of the troposphere, however, there is little doubt that the atmospheric gases tend to distribute themselves according to their atomic weights; the heavier below, the lighter on top. The upward extent of each constituent of the atmosphere can be computed; and from such a computation it appears that oxygen dwindles to the vanishing point at an altitude of about fifty miles, at which level the "air" is mainly nitrogen; that nitrogen vanishes rather abruptly a little higher, leaving hydrogen in possession of the field. Just what changes in optical, acoustical and other properties of the atmosphere may be implied in this change of composition is much too recondite a question to discuss here. It appears to have been settled to the satisfaction of certain German meteorologists, who talk of two atmospheric layers above the atmosphere.



A FLOATING UPPER-AIR OBSERVATORY.
Germany's very unusual "kite station" at Friedrichshafen, on Lake Constance. Kites and balloons are sent up daily from a moving steamboat.

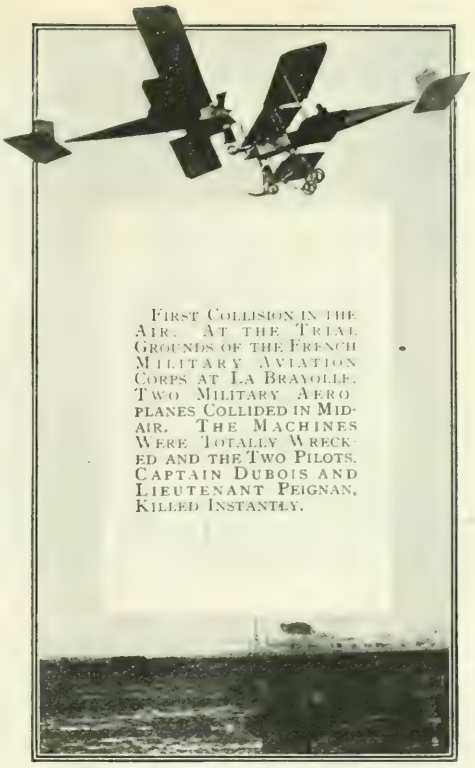
LARGEST SMYRNA FIG TREE

THE photograph on page 106 shows two exceptionally unique features. The tree is the largest and oldest Smyrna fig on the American continent while the thirty-eight persons standing in the foreground are all members of a single family.

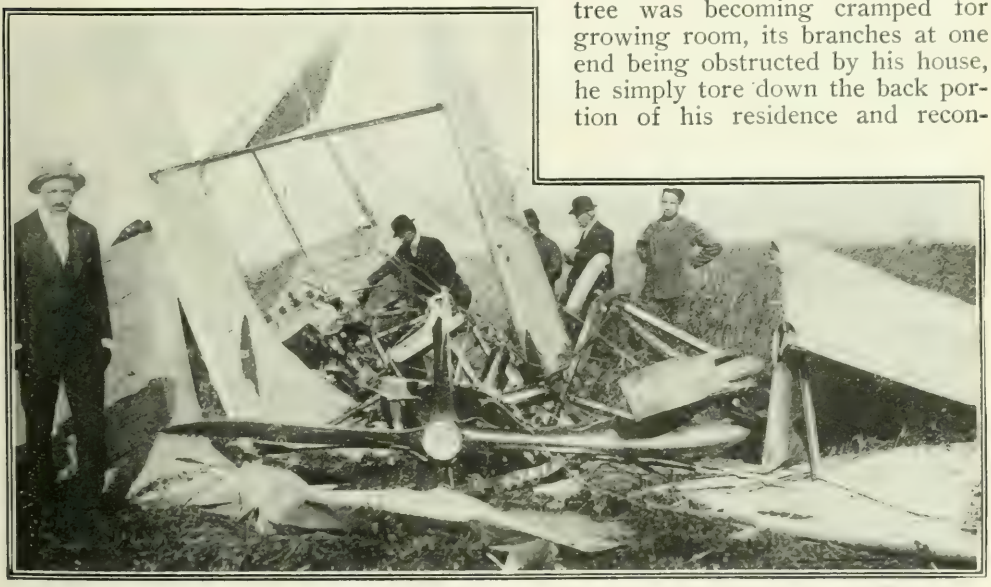
I. N. Parlier, a California pioneer, settled on government land in the fertile San Joaquin Valley, thirty-two years ago. About twenty-eight years ago when the Department of Agriculture was searching for a place congenial to the growth of the Asiatic Smyrna fig, Mr. Parlier planted the tree. The genuine Smyrna fig has only been successfully raised on this continent in the San Joaquin Valley, and this specimen demonstrates that although the tree does not seem to flourish elsewhere, it certainly grows here, with a vengeance.

The tree is nearly eight feet in circumference at its base. Its branches have a spread of sixty-eight feet. Its tallest twig is thirty-seven feet above the ground. Through the stronger branches in the center of the tree bolts have been set from which wires have been strung to support other weaker branches, as the wood of the fig is very brittle. A wooden trellis, ten feet high, supports all the lower limbs and when the tree is in foliage a lovely shaded court is formed below.

So much does Mr. Parlier think of his "giant" that when he noticed the tree was becoming cramped for growing room, its branches at one end being obstructed by his house, he simply tore down the back portion of his residence and recon-



FIRST COLLISION IN THE AIR. AT THE TRIAL GROUNDS OF THE FRENCH MILITARY AVIATION CORPS AT LA BRAYOLLE. TWO MILITARY AEROPLANES COLLIDED IN MID-AIR. THE MACHINES WERE TOTALLY WRECKED AND THE TWO PILOTS, CAPTAIN DUBOIS AND LIEUTENANT PEIGNAN, KILLED INSTANTLY.



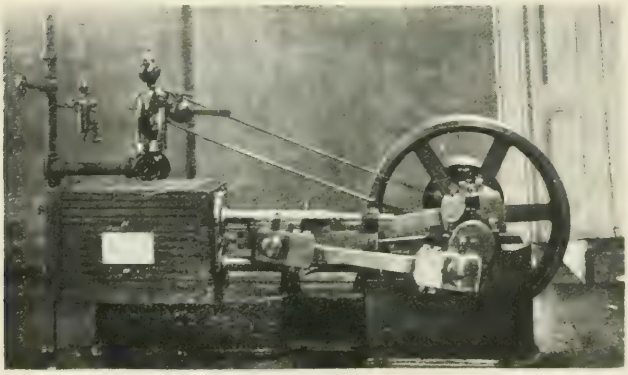
THE WRECK OF THE AEROPLANES.

ALL ONE FAMILY GATHERED UNDER THE LARGEST SMYRNA FIG TREE IN AMERICA.
The grandfather is the seventh person—not considering the baby—counting from the right.

structed it as shown in the picture. Now, the tree expands unrestricted by any artificial restraints that man may have placed around it.

It bears a large crop of fruit annually, when properly pollinated, and the figs have a very delicious, nutty flavor.

Mr. Parlier is sixty-two years of age, but no casual observer would give this youthful enthusiast credit for having passed farther than the two-score mile post much less believing that he is father or grandfather of all the people standing about him grouped in the picture shown above.



ENGINE THAT EXERTS THE FORCE OF STEAM IN TWO DIRECTIONS AT ONCE.

ENGINE WITH HEADLESS CYLINDERS

BELIEVING that more power can be secured from an engine exerting the force of steam in two directions at once instead of one as in the ordinary engine, an inventor of Biloxi, Miss., has built an engine with headless cylinders.

The engine has two cyinders one above the other as shown in the illustration, each containing two pistons. The steam enters at the middle instead of at the ends of the cylinders as in most engines and drives the two pistons apart, forcing them to opposite ends of the cylinder.

In order to apply the power thus developed one piston is supplied with a tubular rod sliding over the solid rod with which the other piston is equipped and the one making the forward stroke in one cylinder is attached to the one making the backward stroke in the other cylinder by means of sliding pieces called cross heads. The result is that as the pistons in the upper cylinder are forced apart by

THE MUSICAL WATER POT.

How often does it happen that the housewife or servant puts a pot full of water on the fire but that she does not again remember it, being occupied with other matters? The average old-fashioned pot does not complain. It boils patiently, filling the kitchen with steam, wasting gas, coal, or electricity, as the case may be. Suddenly "she" remembers and runs to the rescue. Our new friend, the musical water pot, behaves differently. It is not so patient but whistles very zealously by means of a whistle inserted in the outlet as soon as the water begins to emit steam. The lazy servant, whether she likes it or not, must attend to it. The whistle is simply fastened in the outlet by means of a lateral movement so that all the steam has to escape through the whistle.

the steam entering them the pair in the lower cylinder are brought together, forcing out the exhaust steam.

The attachment of the solid piston rods to the cross heads as described is made possible by the tubular rods being slotted.

The engine differs in appearance from others in having the two cylinders and also two cranks, but the valve mechanism is quite similar to that of other engines.

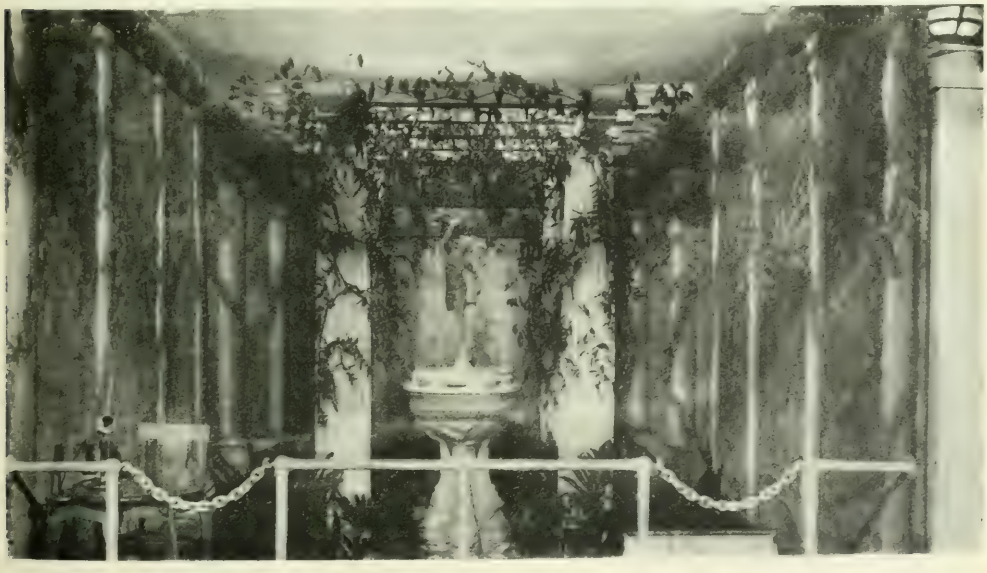
The ends of the cylinders are covered with shields to keep out dust and other matter that might interfere.

ELECTRIC FOUNTAIN OF CONCRETE

A BEAUTIFUL and most artistic concrete fountain has been constructed at Minneapolis, Minn. The tank, or basin, is 4 feet 6 inches by 8 feet inside, with an 18-inch ledge all the way around, and it is set up 18 inches high, on top of which the fluted columns of the pergola rest.

In the top of the pergola are colored lights which work with a flasher, controlling 250 16-candle power lamps. The colors, red, blue, green and amber, are used, changing very slowly, thus giving the most beautiful color effect to the water as it plays about mercury in the center of the pedestal.

The ornamental vase and pedestal are cast of concrete with four dolphins supporting the upper part by their tails, their heads just under the water line.



A BEAUTIFUL FOUNTAIN BUILT OF CONCRETE.

The pump, motor and flasher are direct connected and stand behind the scenery. The water is pumped out of the tank and back through the fountain.

OVER-EATING WIPING OUT A RACE

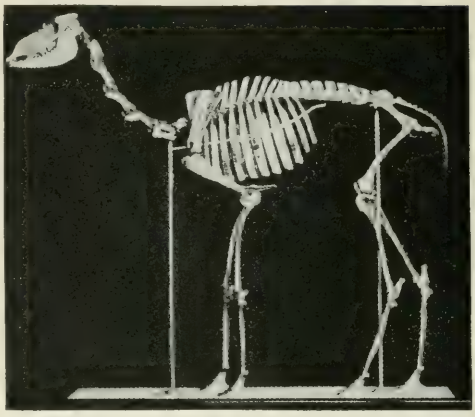
THE Osage Indians, of Osage County, Oklahoma, have the famous diners of New York City outstripped in the matter of individual food consumption. The Osage eats five and six meals a day —enormous meals of rich, greasy food. At public gatherings and on the streets they are seen invariably munching a meat sandwich or anything else edible obtainable.

Since they have practically abandoned active outdoor life and elected to dwell in ill-ventilated houses, the excess of food and lack of exercise and fresh air has resulted in impaired digestion, severe emaciation, and tuberculosis.

The latter disease is claiming so many victims that the Osage will soon be extinct unless his habits of living are altered.

THE ANCESTOR OF THE CAMEL

IN the Carnegie Museum at Pittsburgh, Pa., has just been set up some of the most unique and valuable fossils unearthed in this country: the first fossil camels ever discovered intact. And it is a surprise to the laymen to find that these ancestors of the big camels and dromedaries of today were no larger than Italian greyhounds, and of much the same build; with long necks, slender legs and toes instead of cushioned feet. The skeletons are said to be no less than four million years old, and were found in the Miocene strata of rocks in western Nebraska by Prof. O. A. Peterson of the Museum and Dr. F. B. Loomis of Yale University, both noted paleontologists.



Skeleton of One of the Ancestors of the Camels.

The find excited unusual interest among scientists the world over. The specimens—twenty-nine all told—belong to a hitherto undiscovered species. Their scientific name is Stenomylus. They are more complete than any other Miocene mammals ever found. From the fact that they were all excavated from one spot it is surmised they constituted a herd; and that they were suddenly overtaken with some eruption of nature, or were mired in one of the swamps of prehistoric times.

The camel originated in America, scientists say, in the western part of the United States. The earliest progenitor was the Tylopoda, which was about as large as the European hare and had five toes. It is one of the ancestors of the pig. From the remote age in which they lived the animals evolved into larger ones until they have reached the huge size of the bactrians of Arabia and Africa of today.

A Full-Blooded Osage Indian. Wife and Child.

MAKING ARTIFICIAL DAYLIGHT

By

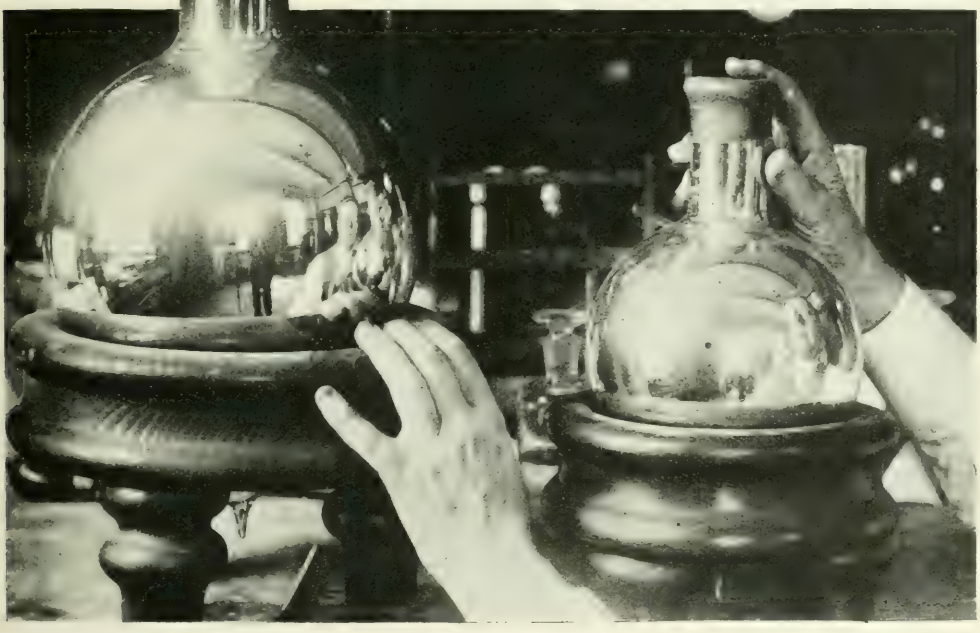
ROBERT FRANKLIN

RUNNING around the ceiling of a room at the Bureau of Standards, in Washington, is a glass tube about three inches in diameter, filled with silvery white light. It gives a very brilliant illumination, and in color is the nearest approach to the light of the sky that has been obtained up to date.

The pipe, nearly a vacuum, contains a small quantity of carbonic acid gas, which is rendered luminous by passing a mild current of electricity through it. An interesting point about this kind of light is that it has already come into industrial employment, being used—by reason of its likeness to daylight — in silk mills and other places where textile materials are manufactured or handled, to make sure that perfect "matches" of the goods are obtained.

Of great importance, however, is the fact that this method of lighting looks toward the solution of the whole problem of illumination. What we want is artificial daylight. How shall we get it?

Most gases when thus dealt with, in a glass tube, are luminous. Helium gas is a beautiful golden yellow. Neon (a recently discovered gas, which is an ingredient of ordinary air) is reddish, and therefore adapted for spectacular effects rather than for every-day use. A couple of hundred feet of tubing filled with it, running around the ceiling of a restaurant, will produce a brilliant and attractive glow. It is obtained in very small quantities by evaporating a great many



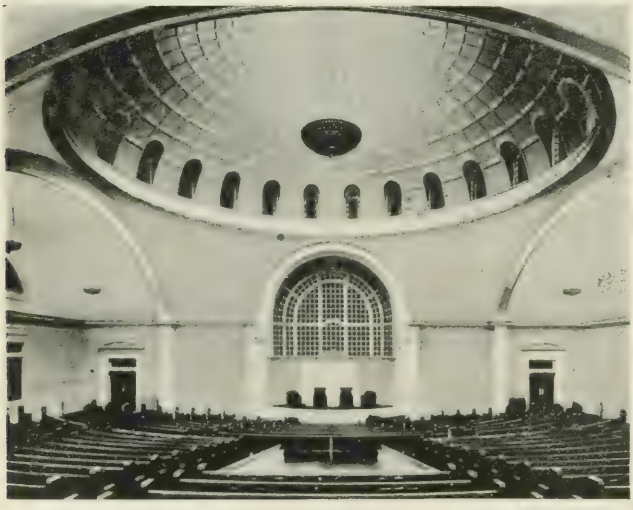
FLASKS OF LIQUID GAS FOR MAKING "NEON" GAS—A PINK ILLUMINANT.

VESTIBULE OF THE WHITE HOUSE, ILLUSTRATING THE WAY IN WHICH AN INTERIOR OUGHT NOT TO BE LIGHTED.

gallons of liquid air, with some chemical "monkeyings" to separate it out.

This means, of course, that neon is costly. A little bottleful of it, however, will fill a good many feet of tube, because only a trifling quantity is needed. But gases used in this way for illumination are broken up before long and destroyed by the electricity passed through them, and so there has to be an arrangement by which the tube automatically recharges itself from a reservoir. When the pressure inside the tube falls, a valve opens, and more of the gas is admitted.

Various gases have been employed, but only one, it is stated, has proved efficient enough to be economical for the purposes of ordinary illumination. But this casts a greenish-blue glow that is not only ghastly and horrible, but, owing to the presence in it of many ultra-violet rays, very injurious to the eyes.



ILLUMINATING A CHURCH WITH A SUSPENDED "BOWLFUL" OF INVISIBLE LIGHT

The newest idea for obtaining artificial daylight is to combine a mercury vapor tube with the tungsten incandescent lamp. For this purpose the tungsten lamp (which gives off many red rays, wholly absent in the mercury glow) is placed in the middle of a ring-shaped glass tube containing mercury vapor. Then both are enclosed in a

big ground-glass globe. The effect is that of an enormous luminescent opal, most beautiful as well as agreeable to the eye.

We may yet live to see the streets at night illuminated by counterfeit suns arranged on this principle, producing a brilliant and diffused light vastly preferable to that to which we are now accustomed. Already a step in this direction is being taken by substituting tungstens in ground-glass globes for the naked gas lights, which are an unmitigated atrocity, hurting the eyes and rendering the darkness in their neighborhood additionally obscure.

At the Health Congress, to be held in Washington a year from now, the Bureau of Standards proposes to make an "illumination exhibit." If it be asked what lighting has to do with health, the answer is, everything. Leaving aside its importance for the preservation of eyesight, light in plenty is one of the chief essentials to human welfare. All efforts made to improve the condition of slum-dwellers in our cities, while primarily for providing more space and better air, are in the direction of giving them more light. And it is the advanced medical opinion today that the physical benefit obtained by visits to the seashore is attributable much more to exposure to unlimited light than to salt air and exercise.

For an object lesson in lighting, consider the churches, which are the worst illuminated of all buildings. The "dim religious light" proverbially associated with sacerdotal interiors is well enough in the daytime, perhaps; but why have naked lights scattered about, disagreeably attracting the eye, at night?

Some churches, however, are already remedying this trouble by adopting the "bowlful of light" system. A bowl-shaped fixture hangs from the roof, containing and concealing from view a number of brilliant electric lamps, which throw their radiance upward. The light, thus reflected from ceiling and walls, is delightfully diffused. In many hotel lobbies, and to some extent in private houses, the same expedient is now employed.

When a traveler at night enters the great waiting room of the Union Railroad station at Washington, he finds the whole place filled with a sort of moonlight radiance. Yet, when he looks about him, he sees not a single light. Electric lamps furnish the illumination, but all of them are hidden behind a cornice which runs around the upper part of the room. The same method is now being adopted for the lighting of many drawing-rooms, and of ballrooms both private and public.

Naked lights are particularly undesirable on the stage. People in the audience cannot help staring at them; they are disagreeable, and they hurt the eyes. To some extent theatrical managers have begun to realize the importance of this matter, and are acting upon the idea. The problem as regards the illumination

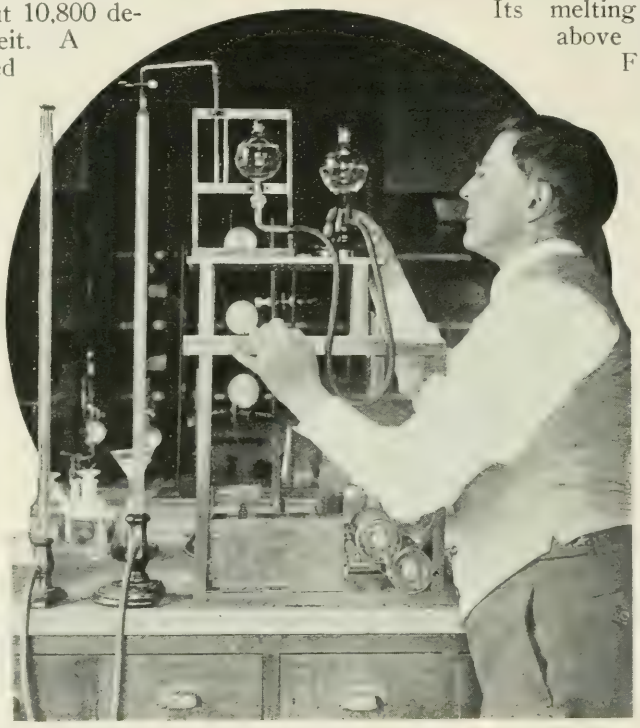
Even the Electric Stoves Furnish a Diffused and Beautiful Illumination Nowadays.

of street-cars is practically untouched as yet, but something is bound to be done about it before long.

To get white light, resembling daylight, we must have a very high temperature. The temperature of the sun is about 10,800 degrees Fahrenheit. A lamp operated at such a temperature would give us daylight. But all known substances melt, or else evaporate, before arriving anywhere near that point.

The filament of a carbon incandescent lamp is black. When a current is passed through it, it becomes luminous but reddish — which means a relatively low temperature. The hotter the filament becomes, the more light it gives and the less heat, proportionately to the energy employed. Unfortunately, if the carbon thread be raised to white heat, though it will not melt, it evaporates and blackens the inside of the bulb.

This is where the usefulness of the rare metal tungsten comes in. Its melting point being above 5,400 degrees Fahrenheit, it can be operated at a much higher temperature than the carbon filament. It gives three times the amount of light for a given power, and is proportionately more economical. Newly-discovered processes have made it possible to obtain tungsten in a very pure state, and to draw it out into fine wire—so that, by this single achievement we have reduced the cost of electric light to one-third of what it was ten years ago.

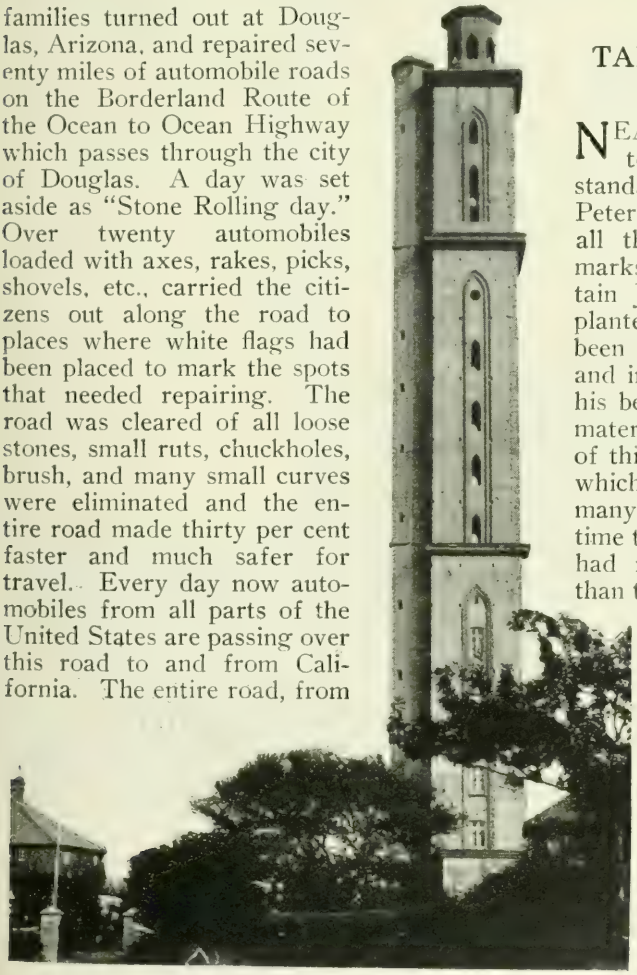


Testing Gases Used for Electric Illumination at the Bureau of Standards.

STONE-ROLLING DAY ON THE BORDERLAND AUTOMOBILE ROUTE.

CITIZENS BUILD ROADS

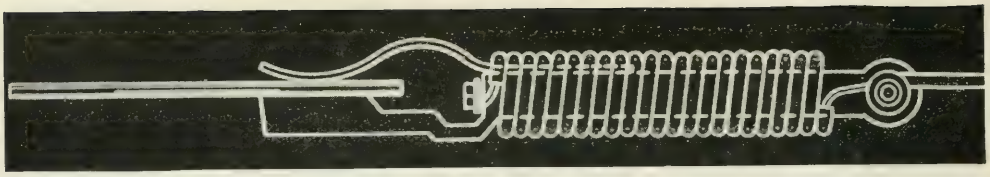
EIGHTY-SEVEN business and professional men with their families turned out at Douglas, Arizona, and repaired seventy miles of automobile roads on the Borderland Route of the Ocean to Ocean Highway which passes through the city of Douglas. A day was set aside as "Stone Rolling day." Over twenty automobiles loaded with axes, rakes, picks, shovels, etc., carried the citizens out along the road to places where white flags had been placed to mark the spots that needed repairing. The road was cleared of all loose stones, small ruts, chuckholes, brush, and many small curves were eliminated and the entire road made thirty per cent faster and much safer for travel. Every day now automobiles from all parts of the United States are passing over this road to and from California. The entire road, from Dodge City, Kansas, to El Paso, Douglas and Phoenix is now in the best possible shape and perfectly safe.



SAID TO BE THE TALLEST TOMB IN ALL ENGLAND.

TALLEST TOMB IN ENGLAND

NEAR the well known seaport town of Southampton, England, stands a remarkable edifice called Petersen's tower. The erection is all the more singular because it marks the burying place of a certain John Petersen, a wealthy tea planter. The man appears to have been rather an eccentric individual, and in order to prove to the world his belief in concrete as a building material, set about the construction of this great tower. The building, which is entirely of concrete, took many years to complete, and by the time the final layers had been placed had reached an altitude of more than three hundred feet. It is about forty years since the tower was erected and its present condition is certainly justification of the faith of the builder. Petersen left instructions that his remains should be placed under the tower, and this was accordingly carried out. Another desire that the chamber at the summit should contain a light was defeated by the firm stand which the English light house authorities took in the matter.



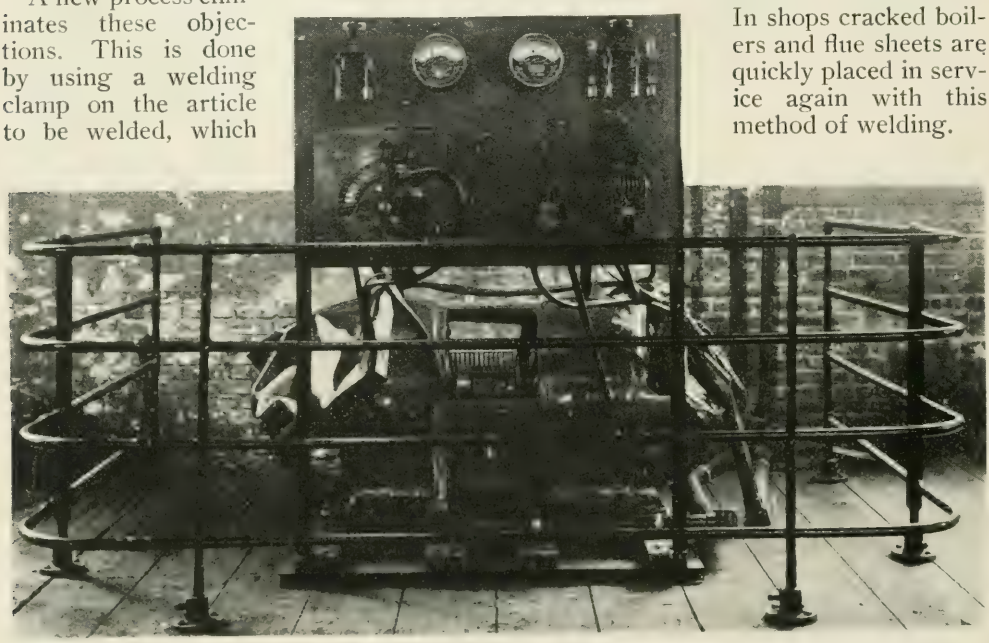
THE WELDING CLAMP WHICH IS MAGNETIZED AND MAKES THE MOLTEN METAL FLOW INTO THE WELD BY MAGNETIC FORCE.

Such an illumination would have been visible for miles out at sea and would naturally have proved very misleading to sailors.

NEW WELDING PROCESS

ELECTRIC welding has been done by many different methods. The most common of these is the welding of metal by using the article to be welded as one electrode of the circuit and a carbon as the other. This requires a great amount of current, dangerous to the workman and expensive and hazardous to have in any manufacturing establishment on account of the fire risk. Another method was to use two carbons as the electrodes and put the article to be welded in contact with the resulting arc.

A new process eliminates these objections. This is done by using a welding clamp on the article to be welded, which is held in place by a few coils of wire around it which magnetize it and make it stick fast to the material on which the weld is to be made. This magnetizes not only the clamp but also the welding wire which forms the metal electrode and is melted by the heat generated. As this melted metal drops from the welding wire it follows the lines of force and flows over the metal at the point to be welded. Thus the magnetism resulting from the turns of wire around the welding clamp is used to deposit the melted metal where it is needed as well as keep the clamp firmly fixed to the article being welded. So strong is the magnetic attraction that the molten metal is attracted into the most intimate contact with the metal of the welded article and only a small amount of flux is necessary to remove the oxide from the welded metal on this account. In shops cracked boilers and flue sheets are quickly placed in service again with this method of welding.

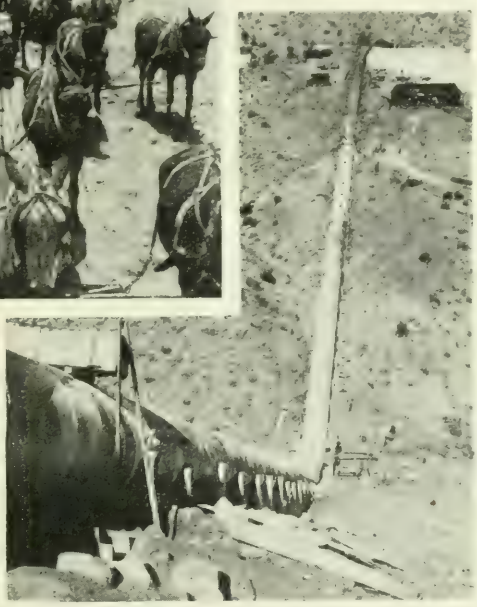


THE DYNAMO, SWITCHBOARD AND RHEOSTAT USED IN THE ELECTRIC WELDING PROCESS.

THE FIFTY-TWO MULE TEAM HAULING A THIRTY-FOOT SECTION OF THE ELEVEN-FOOT STEEL PIPE.

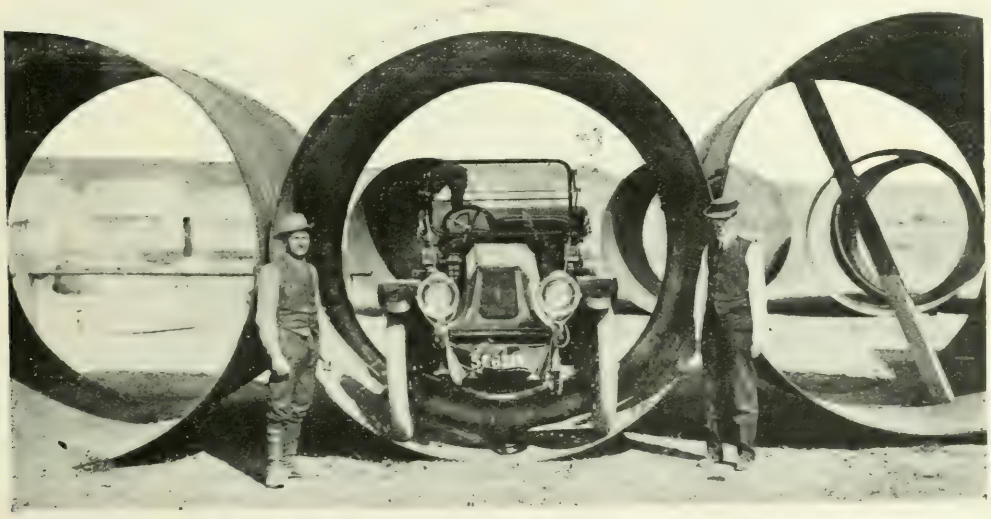
FIFTY-TWO MULE TEAM

THE use of a team of fifty-two mules to haul a single thirty-foot section of the huge pipes, gives a fair idea of the size of the steel siphon now being constructed as part of the Los Angeles Aqueduct. It was a great problem to get these sections into place, for while the ordinary steel pipe of large dimensions can be hauled as plates, and assembled on the ground, this piece of work was of such remarkable size that the job of riveting it had to be done in the shops. Caterpillar engines and other traction engines were abandoned for this purpose, as it was found that they were considerably more expensive and less reliable than old-fashioned Missouri mules. It is claimed that no team of such numbers has ever been used elsewhere.



THE STEEL SIPHON CROSSING NINE-MILE CANYON.

The steel plates which compose the siphon are one and an eighth inches thick, and the diameter of the pipe is eleven feet. An auto can be driven through it with room to spare, and



STEEL PLATES FOR THE MONSTER SIPHON.

each section has the weight of twenty-four tons. The length of the haul from the railroad is four miles.

The siphon which connects the tunnels of the Jawbone Canyon has a length of 8,095 feet and represents the enormous weight of six and a half million pounds of steel. From the tunnel at the northern end, it drops into the canyon to a depth of 850 feet and then rises at the southern tunnel to within about twenty-nine feet of its higher point. The Soledad Siphon has a length of 8,060 feet. Both are carried on heavy piers of reinforced concrete.

These steel siphons and some of shorter length are among the last links to close the chain of tunnels, conduits and trenches which compose the Los Angeles Aqueduct. The great work is nearing completion and it is expected that it will be finished in January, 1913.

Thus will successfully end Los Angeles' gigantic effort, at a cost of $23,000,000, to secure an adequate supply of pure water to supply all the needs of all its inhabitants.

A Difficult Juggling Feat.

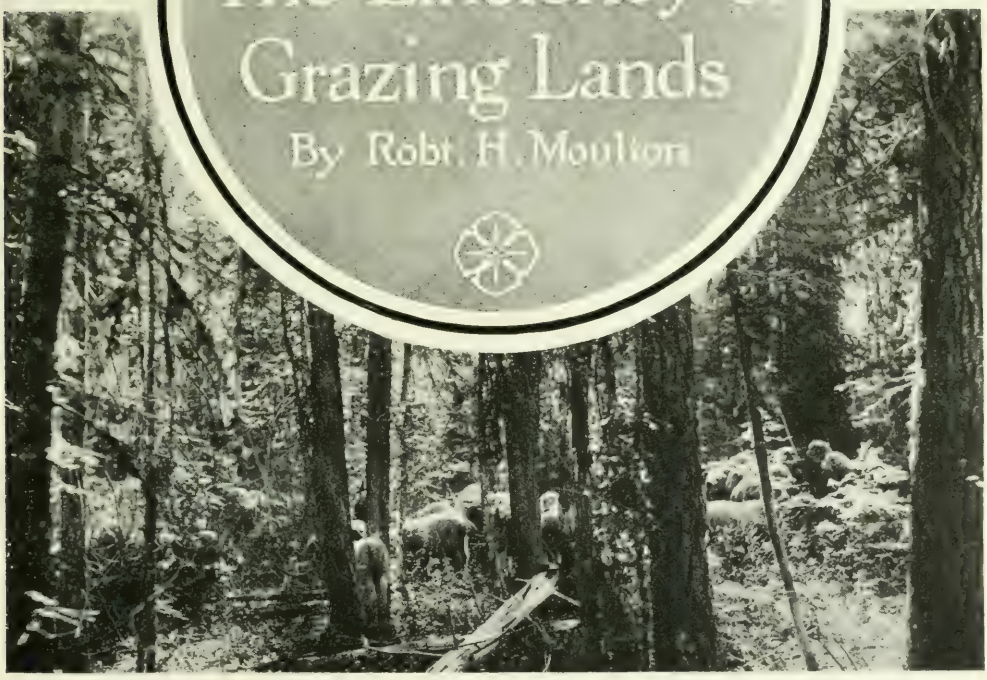
A Splendid Photo of an Unusual Sort.
One of New York City's mounted police trying out his horse in Central Park.

JUGGLING OF UNUSUAL SKILL

In Berlin, Germany, a clever acrobat of the name of Johnston has recently brought much glory upon himself and many shekels into his capacious pockets by his really wonderful feats in the way of juggling and balancing. His star performance is one of the most difficult ever attempted probably by a stage "artist." It consists in Johnston balancing himself on one foot on a slack wire a little above the stage floor while at the same time, he maintains on his forehead, an inverted beer bottle, above which four independent rods, support a table, in the center of which, on a white table cloth, reposes a basket of flowers. Inasmuch as in all other businesses or professions, sharper competition demands year by year greater skill, or acumen, the juggler is hard put these days to find new tricks with which to fascinate his audiences.

Increasing The Efficiency of Grazing Lands

By Robt. H. Moulton



PASTURED SHEEP GRAZING IN DENSE FOREST IN THE COYOTE-PROOF PASTURE.

DO the sheepmen of this country know that by using a system of fenced pastures, instead of the present method of open range herding, they can increase the size of their lambs from five to ten pounds in a single season, make the wool clip from one to three pounds heavier, reduce the acreage of range now required one-third, and decrease the present loss and the cost of handling four-fifths?

In 1907 the Federal Government set aside an area of 2,560 acres within a large sheep range on the Wallowa National Forest in northeastern Oregon, fenced it in with a combination woven wire and barbed wire fence, and turned loose a normal band of sheep. It was necessary to make the fence as strong and impenetrable as possible owing to the wide prevalence of coyotes throughout the forests of that locality.

During the first three seasons—the pasture has been used from approximately June 20 to October 1—the fence was patrolled each morning between 4 a. m. and 10 a. m. by a hunter with trailing hounds. A record was kept of each animal that came to the fence line and its attitude toward the fence. Bear, which were numerous in the beginning, went

THE SKINS ON HIS CABIN WALLS ATTEST TO THE PROWESS OF THIS FOREST RANGER

through at will. By the end of the second season, however, successful hunting had reduced their number until they were not a menace. The coyote was present in the beginning and is present yet, but during the season, so far as could be ascertained, not one succeeded in getting inside the fence except when the snow lay deep in winter. They have caused no loss whatever.

To determine the comparative number of sheep that the range in question would support under the two systems, observations were made to ascertain the grazing capacity of approximately thirty thousand acres surrounding the experimental area. The outside range was similar in character to the enclosed area, and was grazed each year during the same season as the pasture by four or five bands of sheep. In 1908 the herded bands used from one and a half to two times as much range per head as the pastured sheep. The following seasons showed a similar percentage.

During the seasons from 1908 to 1911 inclusive from twenty to thirty lambs were weighed and given a special mark at the time they were turned loose in the pasture, and weighed again when taken out at the close of the summer season. The records showed that the pastured lambs gained on an average of twenty pounds during the first season of approximately ninety days, while lambs of the same grade handled under herding on range near the pasture gained on an average only fifteen pounds during the same period. This difference was increased from seven to ten pounds the succeeding seasons. It should be remembered, too, that results given for the pasture were secured on approximately two-thirds the acreage per sheep that was used by the herded sheep.

The greatest loss under pasture for the four seasons never reached one per cent, and went as low as one-fifth of one per cent, while the loss from herded bands near by varied from one to four per cent.

Without a year-long test under pasture it has not been possible to get an actual comparison on the growth of wool between the two systems. The owner of

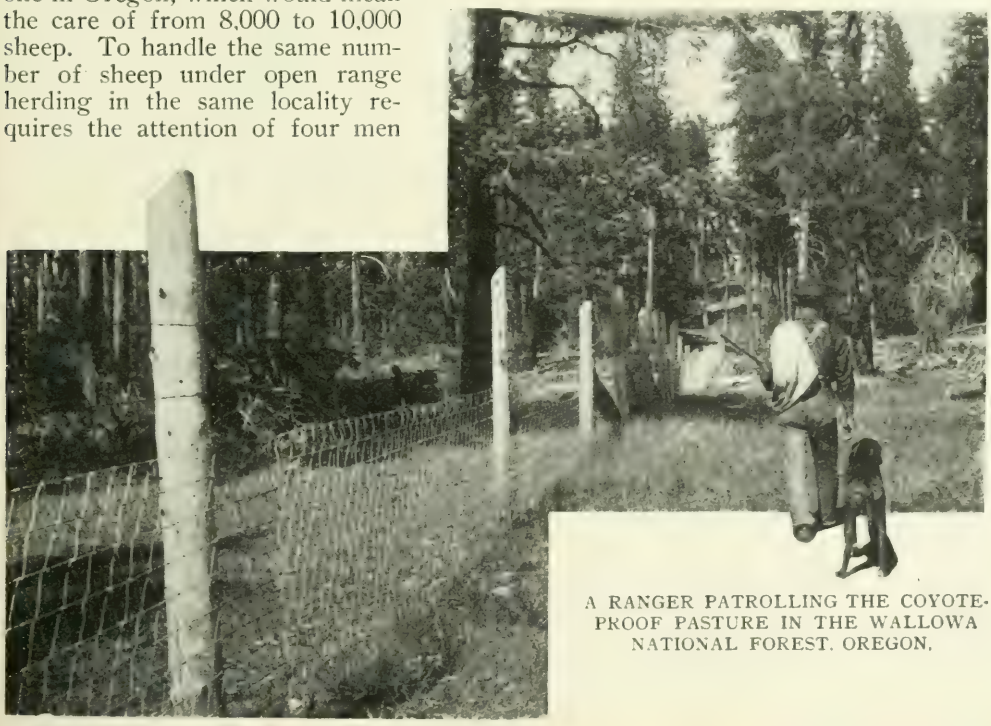
the lambs raised in the pasture on 1908 stated, however, that when they were sheared in 1909 the clip was at least a pound heavier than any other lambs of the same age and breeding he had ever sheared. Sheep grazed the whole year on alfalfa pastures in Arizona for two years sheared three pounds more wool than the same sheep had sheared under range herding.

It is a recognized fact that the growth of wool and its quality are very closely allied with a healthy uniform condition of the sheep. Under pasture the sheep are free and quiet all the time, they grow larger and can be kept in better and more uniform condition of flesh than when herded. It is reasonable to suppose, then, that the wool growth would be from one to three pounds over the average clip under herding, and it would be more uniform in quality.

The comparative cost of handling under the two systems depends somewhat upon the locality, as the present cost of this item varies considerably throughout the West. It has been determined, however, that one energetic man familiar with handling under pasture could care for four pastures similar to the one in Oregon, which would mean the care of from 8,000 to 10,000 sheep. To handle the same number of sheep under open range herding in the same locality requires the attention of four men working as herders and two men tending camp. This, of course, does not take into account the original cost of building the fences. It is figured, however, that a fence should pay for itself, in the results gained, in not to exceed five years, and under circumstances it should last fifteen years.

The demand for range in most sections of the West already exceeds the supply. The range area will be still further depleted to make new homes and in many instances each will bring forth a new demand for range privileges. If the number of stock grazing on the unappropriated public domain and the grazing lands within national forests is to increase to meet the needs, the increase must come about by making those lands produce more forage and by improving the existing systems of handling the stock so as to secure a higher grazing efficiency from the forage produced than has been the case.

The excellent results secured from this careful protection of the sheep offers a curious side-light study in psychology. Peace of mind, freedom from sudden alarms and agitations make animals



A RANGER PATROLLING THE COYOTE-PROOF PASTURE IN THE WALLOWA NATIONAL FOREST, OREGON.

A PASTURED BAND OF EWES AND LAMBS IN THE WALLOWA NATIONAL FOREST.
At the close of the season these lambs were each nine pounds heavier than the same class of lambs in bands herded outside the coyote-proof pastures.

thrive evidently in much the same way as do human beings. Of course the absence of incursions by the predatory bear and coyote secure to the sheep not only untroubled days but the opportunity to browse as long as they please upon rich herbage. In any event, however, it has been proved that these protecting fences would pay, in dollars and cents, the sheep-raiser.

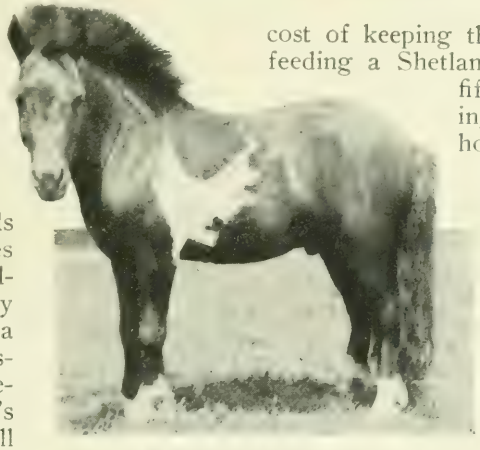
There is an idea abroad among moral people that they should make their neighbors good. One person I have to make good: myself. But my duty to my neighbor is much more nearly expressed by saying that I have to make him happy if I may.

—*R. L. Stevenson.*

SENDING SHETLANDS BACK TO ENGLAND

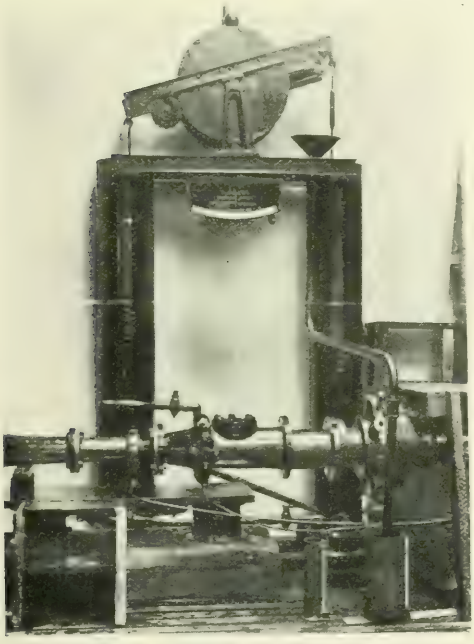
THE first shipment of Shetland ponies from the United States to England has just been made by a concern of pony dealers of Aurora, Illinois. This is certainly a case of "carrying coal to Newcastle"—for the British Isles have been sending these animals to America and other parts of the world for years. Nearly one hundred of these miniature horses were sent in this first shipment, which is bound to become historic. It is estimated that there are about 8,000 registered Shetlands in the United States today. Their breeding in this country has developed into a very profitable industry, owing to their demand for children's use and to the small cost of keeping them. The expense of feeding a Shetland pony is about one-fifth of the cost of keeping an ordinary carriage horse.

THE ONE DAY OLD PONY LOOKS LIKE A TOY.



A SHETLAND STALLION.

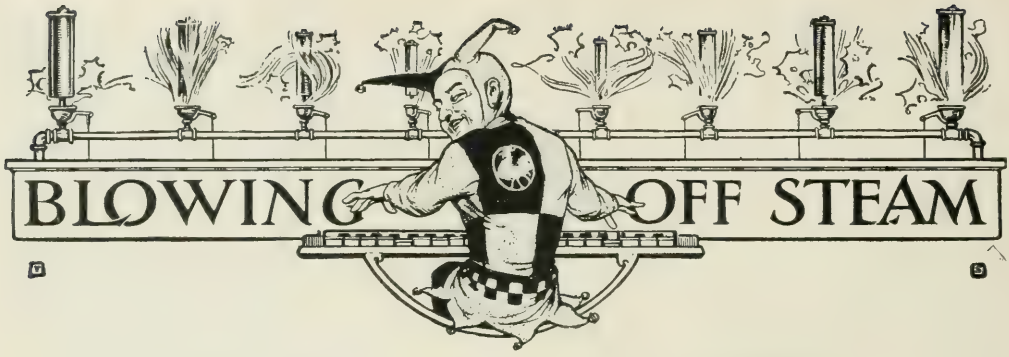
If the registered Shetland ponies now in the United States were redistributed and one pony given to each family in a town of thirty thousand inhabitants, the entire supply would be exhausted and the remainder of the country would be without these "horses for the little folks."



MACHINE FOR INJECTING CHEMICALS INTO LIQUIDS TO PURIFY THEM

ENGLISH DEVICE FOR PURIFYING WATER

THIS apparatus—the tiltometer,—an English patent—was primarily designed for the treatment of very large quantities of water during its purification by means of a precipitating or softening agent, but it can be made equally adaptable for the introduction of similar agents into sewage or other waste. It can also be constructed on a small scale so as to be used by such industrial establishments as are under an obligation to purify their effluents before discharging them into streams or public sewers. The apparatus is extremely simple, yet nevertheless gives exceedingly accurate results. It is also practically free from wear and tear, consequently the accuracy with which it operates will be maintained even in the hands of inexperienced persons.



Back at Him

"YOUNG man, I saw you put your arm around my daughter's waist."

"And I suppose you noticed how she struggled?"—*Detroit Journal.*

Come to Stay

DORIS was radiant over a recent addition to the family, and rushed out of the house to tell the news to a passing neighbor.

"Oh, you don't know what we've got upstairs!"

"What is it?"

"It's a new baby brother!" and she settled back upon her heels and folded her hands to watch the effect.

"You don't *say* so! Is he going to stay?"

"I guess so"—very thoughtfully. "He's got his things off."—*Everybody's Magazine.*

Wicked, Wicked

"I SUPPOSE your wife was more than delighted at your raise of salary, wasn't she?" asked Jones of Brown.

"I haven't told her yet, but she will be when she knows it," answered Brown.

"How is it that you haven't told her?"

"Well, I thought I would enjoy myself a couple of weeks first."—*Judge.*

Same Thing

JUDGE—"Were you present when the trouble started between the man and his wife?"

WITNESS—"Yessir, I was at their weddin,' ef dat's whur yo' means, sah."

No Offense

SHE—"Pardon me, sir, for walking on your feet."

HE—"Oh, don't mention it. I walk on them myself, you know."—*Boston Transcript.*

The Modern Girl

SUITOR—"I can support her in the style to which she has been accustomed."

FATHER—"She wants something better."—*New York Sun.*

Reasonable

"MY dear girl," said her mother-in-law, "any woman would be satisfied with what John says he gives you."

"So would I."—*Puck.*

No Wonder She Blushed

Two of the University of Pennsylvania track runners passed a learned and preoccupied professor showing a young lady visitor through the "Gardens."

With a dainty shiver the girl remarked:

"It's dreadfully cold—isn't it?—to be without stockings."

The professor's mind turned for a moment from contemplation of the fourth dimension.

"Then why did you leave them off?" he asked.—*Lippincott's.*

A Born Candidate

WILLIS—"I suppose you think that baby of yours will become President some day."

GILLIS—"Maybe not President, but he will be in the race after the nomination all right. He keeps the whole place in an uproar, uses indescribable language, and can go without sleep for a week."—*Brooklyn Life.*

Reckless Sybarite

IN Concord, New Hampshire, they tell of an old chap who made his wife keep a cash account. Each week he would go over it, growling and grumbling. On one such occasion he delivered himself of the following:

"Look here, Sarah, mustard-plasters, fifty cents; three teeth extracted, two dollars! There's two dollars and a half in one week spent for your own private pleasure. Do you think I am made of money?"—*San Francisco Argonaut.*

Enterprising Mr. Chestnut

"OH, papa," she said, with a blush, "young Mr. Chestnut, who owns so many coal mines in the Midlands, is coming again this evening, and he says he wants to see you on some important business."

"All right, my dear," responded the old man, chucking her playfully under the chin. "I know what the young man wants."

That evening Mr. Chestnut came to the point at once.

"Mr. Hendricks," he said boldly, "I want to ask you if you have laid in a stock of coal?"—*London Ideas.*

Was Well Paid

ONCE upon a time there was an Indian named Big Smoke, employed as a missionary to his fellow Smokes.

A white man, encountering Big Smoke, asked him what he did for a living.

"Umph!" said Big Smoke, "me preach."

"That so? What do you get for preaching?"

"Me git ten dollars a year."

"Well," said the white man, "that's damn poor pay."

"Umph!" said Big Smoke, "me damn poor preacher."

Pertinacity

AUNT JULIA, Mrs. B——'s colored washerwoman, is a thrifty, respectable and self-respecting representative of her race, but is unfortunate in having an utterly worthless scapegrace son who lately served a richly deserved sentence in the penitentiary at Pittsburgh. Notwithstanding his disgrace, Aunt Julia is exceedingly proud of him, and misses no occasion of chanting his praises. Some time ago, on her weekly mission at the B——'s, she observed:

"Ah s'pose yo'all didn't know ah'm gwine to hab my boy home for Christmas?"

"Indeed?"

"Yes, ma'am, he done wrote yisterday he comin' home Tuesday.

"You must be very glad, Aunt Julia. How long has he been away?"

"Eighteen months. Ah tell you, honey, he jest stuck right to it!"—*Harper's Magazine.*

Deceitful Appearances

"How fat and well your little boy looks."

"Ah, you should never judge from appearances. He's got a gumboil on one side of his face and he has been stung by a wasp on the other."—*The Pathfinder.*

What Are Yours?

SMALL GIRL (entertaining her mother's caller)—"How is your little girl?"

CALLER—"I am sorry to say, my dear, that I haven't any little girl."

SMALL GIRL (after a painful pause in conversation)—"How is your little boy?"

CALLER—"My dear, I haven't any little boy, either."

SMALL GIRL—"What are yours?"—*The Housekeeper.*

The SILENT SCOURGE

By F. C. Walsh, M.D.

WHILE our Marine Hospital Service with its really efficient organization is daily patrolling our salt-water shores, shading its eyes ever and anon in eager and fearsome expectation of the cholera or some other foreign-born plague which never comes, the silent legions of death ride through our land unnoticed, marshalled by a cunning strategist always on the job,—Typhoid fever. His record once known, prophecy is easy. During the coming months of August, September and October, for instance, some twenty thousand Americans will be added to his list of dead and wounded. During the entire coming year, the latest bulletins,—if such shall be issued—will show that this Silent Scourge has conquered something like forty thousand people! But, as a matter of fact, the fruits of this devastating war in time of peace will not be "bulletined"; no newspaper, yellow or otherwise, will know that in this horrible reality lies a great opportunity for a "scoop"; and the Marine Hospital Service, with its really efficient organization as regards all foreign plagues, will continue to patrol our shores on the lookout for cholera, while Typhoid, fighting away from the coast and the notice of the Marines, will give the death-blow to approximately one hundred American citizens every day in the year, on an average!

Thirty-five thousand deaths annually from typhoid! Over three hundred thousand "taken down" with the disease annually! These figures, though true, are almost unbelievable. If cholera, or smallpox, were to gain a hold on our soil and claim one-tenth as many victims, there would be a panic of fear and a very volcano of indignation such as would startle the world; there would be such a burst of furious criticism about the ears of those in authority, that they would have to end the deplorably unmitigated condition or else face revolution.

Let us look into things a bit; let us, if need be, make a few odious comparisons. There used to be a howl and an annual tale of woe against yellow-fever. All that was sad enough and bad enough, and yet yellow-fever was almost a joke in comparison with the annual ravages of Typhoid. The worst epidemic of yellow-fever which this country ever knew was in 1878, when about 75,000 cases occurred. There was a total of 15,000 deaths. An appalling thing to happen in one year! Humanity was staggered. The yellow-death, riding ruthlessly down the wind with his scythe-armed legions, appealed with tragic power to the dramatic instincts of us all. And yet the total of deaths for that year of terror were less than one-half the annual deaths today from Typhoid! Let us compare these figures more closely. Cold figures will show which tells the greater tragedy, for I am convinced that there is as much

tragedy in the facts here presented as in any drama ever written.

	No. Cases 1878.	No. of Deaths.
Yellow-fever	75,000	15,000
	1911.	
Typhoid	350,000	40,000

It would seem from this that all this time Typhoid has been playing a star role in the great tragedy of plagues, while this great American audience of 90,000,000 souls has scarcely been aware of its presence behind the sulphurous foot-lights. It is never too late to sit up and take notice. Perhaps, for one thing, Typhoid has never had the right sort of press-agent, though it would be nearer the truth to say it has had none at all. It has been so different, however, with those other (formerly) star players,—cholera and yellow-fever. It is only necessary to mention the name of either of these in order to get an audience or scatter one to the four winds. These in their time were both feared and respected, while Typhoid, through ignorance or indifference, is neither the one nor the other.

Strange world, with strange paradoxes! We are getting down to cities now. In 1905, for instance, New Orleans experienced the last of its many sieges with yellow-fever. In all there were about 3,400 victims, with exactly 451 deaths. A lamentable fact. So lamentable indeed that the occurrence is still referred to by all who remember it as the "lamentable epidemic of 1905." It was something that burnt itself into the memories of stalwart men and left a scar. And yet, and here's the gist of this comparison, New York's death record for 1910 as a result of Typhoid fever alone was exactly 556, which is more than 100 in excess of the number of deaths due to the yellow-fever epidemic in New Orleans in that "lamentable year of 1905." Yet nobody seems to be lamenting about New York. Is it because of callousness, ignorance, indifference, or what?

But the strange part of this revelation is this: As regards Typhoid New York is a model city in comparison with some of her sister cities! New York's figures were used merely because they were handy. There are more than enough figures,—enough to write a book. If we wished to cast stones we could readily turn to the Typhoid records of other cities, and all American, I am sorry to say, for these really appalling facts and references apply wholly to this country, and for the simple reason that the cities of other countries cannot by any possible chance be dragged into the discussion, merely because they have long since aroused themselves to the tragic seriousness of a preventable condition, and have almost succeeded in wiping out Typhoid from the confines of their various municipalities. Stockholm, as an example, has an annual death-rate from Typhoid of one person to every hundred thousand of population. Compare that with our own largely foreign-born population of Milwaukee. This latter has an annual death rate from Typhoid of 45 to every 100,000 of population. In brief, Milwaukee's death-rate from this scourge is just forty-five times that of the capital of Sweden. But that isn't the worst of it,—Milwaukee is not making any improvement in the matter,—in fact it is going backward at double pace, for in 1900 its death-rate from Typhoid was only 19 to every 100,000 of population. In other words, and again making an odious comparison so that he who runs may read, the figures as between Milwaukee and Stockholm look like this:—

DEATHS FROM TYPHOID PER 100,000 OF POPULATION.

	Year 1900.	Year 1910.
In Milwaukee	19.3	45.7
In Stockholm	no figures	1

This comparison, at first glance, may seem unfair. To show that it is not, let us look at a number of other European cities, and then see how they compare with our recent government report on Typhoid in this country.

DEATHS IN EUROPEAN CITIES FROM TYPHOID FEVER.

Number to each 100,000 of Population.

London	5
Edinburg	2
Paris	8
Rotterdam	5
Glasgow	8
The Hague	1
Copenhagen	7
Stockholm	1

Berlin	4
Hamburg	4
Dresden	6
Breslau	5
Munich (formerly 200)	3
Vienna	4

The figures on Munich are interesting as an illustration showing the needless folly of the astounding number of deaths in our own country, for if Munich could cut down its Typhoid death-rate from the shameless figure of 200 to the insignificant number of 3, the same thing is possible in any city on the globe, with intelligent endeavor taken for granted. All of the European figures in the above list are mere trifles in comparison with the appalling figures taken from our recent government report, as follows:—

DEATHS FROM TYPHOID PER 100,000.

City.	In 1910.	In 1900.
Cincinnati	8.8	39.0
Boston	11.3	24.1
New York	11.6	20.4
Newark	13.1	21.1
Chicago	13.7	21.1
St. Louis	14.9	32.5
Philadelphia	17.5	37.2
Cleveland	17.9	56.8
Columbus	18.1	53.4
Buffalo	20.4	23.5
Detroit	23.0	28.4
Washington	23.2	79.7
Denver	27.5	40.3
Indianapolis	28.5	41.4
Louisville	31.7	64.0
Baltimore	42.0	38.9
Milwaukee	45.7	19.3

These figures, contrasted with the above European list, tell a story which is patent to all. To Cincinnati belongs the credit for not only having the lowest death-rate from the scourge under consideration, but also for reducing it from a very high rate to one so low that it will bear favorable comparison with at least two on the European list. Milwaukee and Baltimore, on the other hand, must bear the brunt of the disgrace. Both of them are worse off than they were ten years previously, but aside from the first five on the list, none of the cities have anything particularly to be proud of. Compare the worst and best on the list with the respective cities in Europe:

MOST CREDITABLE.

In America	8.8
In Europe	1

MOST DISGRACEFUL.

In America	45.7
In Europe	8

As will be seen at a glance, the most creditable American city is worse off than the most shameful one in Europe; while the most shameful one in America is almost six times as much so as the worst in the European figures.

What does all this mean? It means first that without rhyme or reason we are permitting to be stricken annually with a sneaking scourge a number of our people sufficient to populate a city of 350,000 inhabitants; it means that a population equal in numbers to that of a city of 35,000 inhabitants is permitted to be wiped out annually without any protest or expressions of horror or pity; it means that in addition to this foolish and wholesale sacrifice of human life there is also an economical loss to the nation, measured in dollars and cents, that has been estimated at a minimum of $100,000,000, and at a maximum of $300,000,000. Such facts,—if any can—should stagger humanity! Typhoid is not dramatic in its gestures, as are cholera and the plague, but it has a wide stage for action, and in the total of its history has caused more destruction than cholera and the plague combined. These latter have their off years, they make a dramatic entry and exit, and leave a panic in their wake. Typhoid, on the contrary, is ever with us, grinding slowly like the mills of the Gods, but with vastly more destruction. It is time that some one should take the initiative and make a national fight to stamp out what might well be called the great American scourge. Let Marine Hospital eyes cease to cast wistful glances ocean-ward in dread expectation of cholera and bubonic plagues that never come; let government eyes in charge of coast-wise stations look for once landward. As for the people, let them cease to murmur in holy horror over cable dispatches of plague and cholera in India or Russia; let them but glance at their own doorstep, and take to heart the fact that sanitation, like charity, begins at home!

APPLE TREE TO BREAK ITS RECORD

AN apple tree growing in the Walla Walla Valley, Wash., holds the fruit yield, experienced growers predicting that this one tree will produce from 150 to 200 bushels of apples this season, thus breaking its own record of 126½ boxes in 1907, the highest production from a single tree known anywhere in the world. This tree bore 70 boxes in 1906, 42 boxes in 1908 and 45 boxes in 1909. More than 500 barrels of fruit have been picked from it since it came into bearing in the spring of 1871. The tree was grown without irrigation from a seedling planted by C. R. Frazer in 1866. It is 42 feet in height and its branches spread 57 feet from tip to tip. The trunk is 7 feet in circumference at the base and measures 6 feet, 6 inches just below the first limb, which is 4 feet from the ground, and measures 4 feet, 7 inches. The tree is sound and healthy despite the fact that it has produced fruit every season for nearly forty years.

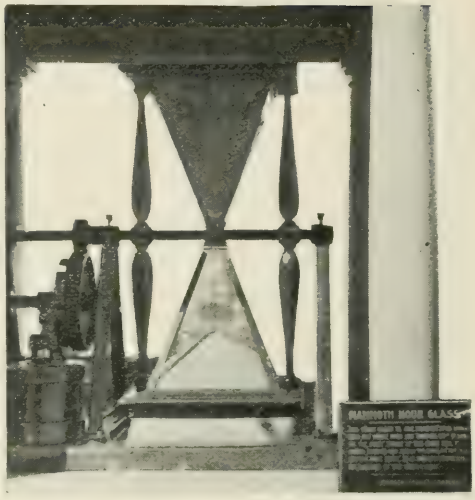
HOUSE BUILT OF BOTTLES.

This curious dwelling, occupied by a miner near Fort Gibbon, Alaska, was built from the bottles thrown away at the fort. A wooden frame holds the whole together.

APPLE TREE THAT IS EXPECTED TO PRODUCE OVER 150 BUSHELS THIS SEASON.

PUMPING WATER BY A STREAM'S CURRENT

THE accompanying illustration shows an unusual method of pumping water by means of a motor deriving its power from the current of a stream, as utilized at Laredo, Texas. This motor is utilized for pumping eight hundred gallons of water per hour to a height of sixty-five feet, although larger motors of similar construction can be made to pump as high as 1,500 gallons per minute. There is a concrete base formed in the bed of the stream and supports arranged for a turn table on which is journaled a shaft carrying the water wheel. Crank shaft and gears are connected with a suction pump. In this case two pump cylinders are used operated by the water wheel for raising the water to a tank on the bank of the stream. There is a cable provided on the shore to operate the turn table. The cable passes through pulleys and a sprocket chain is connected to the gear wheel, with means for adjusting the tension of the cable.



GIANT AMONG HOUR GLASSES.
This primitive time piece contains over a hundred pounds of sand. When the lower portion is filled a revolving framework in which the instrument is set is turned so that the filled half is brought above the empty half. This revolution is done by means of a hydraulic engine.

MOTOR DERIVING ITS POWER FROM THE CURRENT OF A STREAM.

When it is desired to start the motor, a wheel on the shore is turned which moves the cable and operates the turn table in such a direction that the water wheel is parallel with the current of the stream.

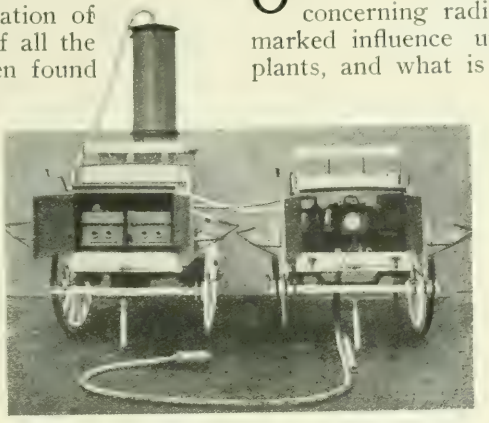
The power is transmitted from the water wheel to the shaft and gear which operate the rod connected with the suction pump. The water is drawn into these pumps through strainers and is forced through the pipe to any desired height or distance. There is a flexible tube for conveying the water from the suction pump to the main pipe and after the desired quantity of water has been pumped, the motor is stopped by turning the wheel on the shore so that the cable operates the turn table in such a direction as to bring the water wheels at right angles to the current of the river.

A current of only three miles per hour can be utilized to advantage.

PURIFICATION OF DRINKING WATER BY OZONE

ONE of our greatest problems in municipal engineering is the purification of water used for domestic purposes. Chemical treatment, extensive filtration, etc., are employed for rendering polluted water fit for consumption. Nothing entirely satisfactory has so far been found; therefore, it is no wonder that electricity has been lately employed on an extensive scale for solving this problem.

The aim in purification of water is the killing of all the germs and it has been found that active oxygen, known as ozone, is the best remedy for accomplishing this task. Oxygen is present in our atmosphere and ozone can be obtained by so-called silent electrical discharges between the electrodes of high voltage. These discharges take place in specially constructed apparatus and the oxygen of the air which is conducted to these electrodes is separated as ozone. This ozone is further conducted into so-called sterilization towers where it comes into contact with the water which is sprayed out very finely. A few seconds are sufficient to kill all those germs which are dangerous for our system. Authorities like Professor Koch of Berlin, Pasteur of Paris, and others, made exhaustive trials and tests with typhoid and cholera bacteria and found that, after treatment with ozone, the sterilization was complete. Encouraged by these authorities, ozone works on a large scale have been erected in a number of cities in Europe. The largest are those of St. Petersburg, Russia, Nice, Italy, and Paris. All these installations have proved that ozone is an absolutely sure remedy for killing dangerous germs and that it is a cheap means



Ozone Apparatus, for Army Use, on Wheels.

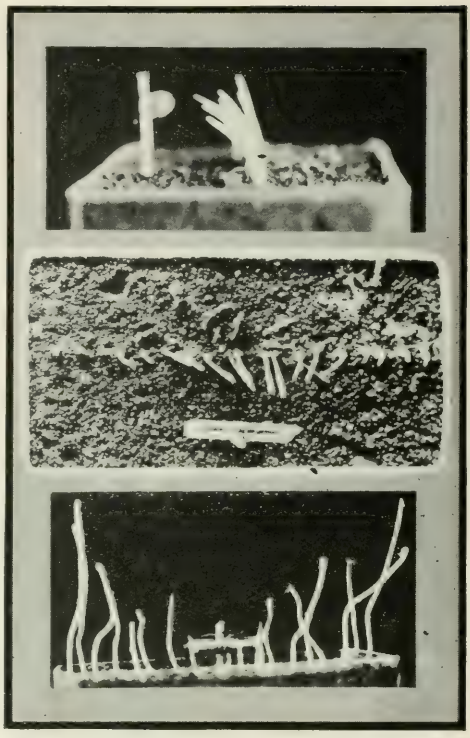
Sterilization Towers of the Ozone Works in St. Petersburg, Russia.

RADIUM BOTH HELPS AND HINDERS PLANTS

ONE of the most recent of discoveries concerning radium is that it has a marked influence upon the growth of plants, and what is striking is that not all plants are affected in the same way. Radium is found to favor the growth of some plants while it hinders the growth of others Professor Molisch of Vienna showed this very well in his late experiments herewith illustrated. He made use of some of the powerful radium tubes belonging to the new Radium Institute of that city, and owing to the fact that the establishment now has radium preparations to the value of $200,000, it will now be possible to carry out much interesting work in this field.

Oat sprouts, this professor found, have their growth favored by radium rays. First the sprouts were grown in total darkness, then they were transplanted in trays in a straight row. As soon as they reached about an inch in height they were taken to the special radium dark room. The powerful radium tube is fixed on a short rod so as to face the row of sprouts.

After forty-eight hours in this position a photograph was taken. The tube was set about an inch away. It will be seen that the sprouts lying near the tube are much bent towards it, the effect being less towards the ends of the row on account of the greater distance. The next plant to be tried was the vetch plant, but Professor Molisch found to his surprise that it behaved in quite a different way towards radium. In this case the tube was fixed less than half an inch from the row of sprouts and lay somewhat above these when they had an inch or less growth. Another photograph was taken four days later, and it will be seen that the sprouts lying next the ends of the row appear to have the middle part at least bent towards the radium, but the ones which are quite near the tube are much stunted in growth both in height and thickness of the stalk. The farther sprouts reached from three to eight inches in height, while the middle ones did not grow to more than an inch or so. From these and other experiments it was found that radium rays affect different plants in various ways, and in general they are favorable to the oats and other plants which were tried, while in a few cases such as the one just mentioned, the rays had a bad effect. In the favorable cases the plants turn towards the radium rays just as they turn ordinarily towards the sunlight.



Effects of Radium on Plant Growth.
Top photo: Oat sprouts exposed to radium for forty-eight hours. All the sprouts are bent. Second photo: Oats—looking down upon the plants. Third photo: Sprouts near tube stunted in growth.

A Novel Steering Gear.

NOVEL STEERING GEAR

A QUEER turnout is shown in this photograph of a little wagon drawn by three dogs, guided by means of an unusual steering gear which runs on two wheels. These wheels are attached to the front of the shafts and run ahead in such a way that they can be guided by a pair of reins held by the driver, the axle working on a pivot. With this device it is not difficult to guide a team of dogs and the animals are not burdened with superfluous and annoying harness. All they do is to furnish the motive power and follow the guide wheels.

This outfit is in daily use in one of the mining camps of Alaska and the dogs are of that hardy type which has helped the white man conquer the wild and almost inaccessible passes of that territory.

CHARLES MALLORY HATFIELD READY TO BREAK A DROUGHT.

BREAKER OF DROUGHTS

By

M. A. WILSON

THE title of "rainmaker," by which he is popularly known along the Pacific Slope, Charles Mallory Hatfield modestly disclaims. "I do not say that I can make rain," he explains. "That would be absurd. My claim, borne out by over ten years of successful demonstration, is that I can create conditions that will attract the moisture already in the air to a given spot and condense it to the point of precipitation. It would perhaps be nearer the mark to call me an inducer of rain."

Interest in Hatfield was first aroused in 1903, when the persistent dry weather in the region about Los Angeles brought him quite suddenly into the public eye. For years he had been studying the subject of droughts and quietly experimenting with the problem of attracting moisture through artificial means. These experiments were known only to his immediate acquaintance, and when a quiet young man, not long in his twenties, came suddenly forward and offered to break the drought, astonishment and skepticism ran riot. Even the newspapers looked upon it as a huge joke. The young scientist stuck to his guns, however, till finally a group of Los Angeles merchants decided to take up his offer. They entered into a contract with him by which if he brought rain within a stated number of days they would pay him a stated sum in return; no rain, no pay.

He built his tower and began work February 2nd, 1904. By February 9th the inch for which he had contracted had fallen, and .64 inch besides.

The same conditions threatened the following year. Storms that flooded the districts north and south of southern

California, passed this region by with mere scattering showers. Once more Hatfield offered to break the drought, and this time his offer was taken up in haste. The contract entered into was on a larger scale, Hatfield offering to bring a fall of eighteen inches for the season, or six inches in excess of the seasonal average of Los Angeles for the ten years previous. Exactly 19.19 inches fell in the time covered by the contract. The papers stopped joking and began to take Hatfield in earnest.

Letters came to him from semi-arid regions up and down the coast asking him to come and see what he could do for them, and since that time, he has been kept busy filling contracts for various communities. The very nature of his contracts advertised him far and wide, for "No rain, no pay," is still his unvarying rule. One contract even took him up into the Klondike region in the summer of 1906, when the Dominion Government and some British mine owners promised him a bonus of $10,000 if he could bring enough rain during June and July to enable the mines to go on with their summer clean-up. Heavy rains followed Hatfield's experiments there.

In March, 1912, the ranchers and business men of the Hemet Valley, California, offered him $4,000 if he would break the most persistent drought known in this region in years. For the past eleven months the total precipitation had been something less than two inches. The most discouraging feature of the drought was the fact that day after day the clouds would mass up across the sky, sometimes hanging so low that it seemed as if one could smell the rain; yet toward night the wind would veer suddenly and blow hot and dry from the desert, scattering the storm before our hopeful eyes. It seemed as if some spell were binding the heavens. "Just the conditions under which I can work most successfully," was Mr. Hatfield's comment.

The first week in March we got a good rain from a storm that swept right down the Pacific Slope, 1.94 inches in all. Los Angeles recorded 2.56 inches for the same storm. But while it was still raining down there a wind blew over from the desert into our valley, and as so many times before, we saw the clouds begin to scatter. The scoffers who had been jeering at wasting $4,000 on Mr. Hatfield when the rain was coming anyway, grew less aggressive. Some said it was no use expecting any more at this time of year.

Meanwhile Mr. Hatfield quietly went on building his towers, and on the evening of the fifth began operations. "I'll have that rain back here soon," he said with a quiet little smile.

And he did. It began raining again on the seventh, and kept on raining with scarcely two days intermission through March and the most of April. The Hemet Valley, heretofore content to lag behind Los Angeles by an average of 2.64 inches in the seasonal rainfall, now caught up and finally crept ahead, until by the end of April we could make this surprising and satisfactory comparison: Hemet 11.79 inches; Los Angeles 11.46. Yet on the night that Mr. Hatfield had begun operations the rainfall in Los Angeles had amounted to almost double the Hemet rainfall.

Even more satisfactory was the thought that now the crops were assured; and the Hemet Water company's reservoir a few miles back in the mountains, which the drought had brought to a low ebb, had now risen over fifteen feet in six weeks, so that all danger of a water shortage was past. These are some of the reasons why many have faith in Hatfield.

In carrying on these operations he erects two towers consisting of stout frames from twenty to twenty-five feet high with large box-like rooms at the top enclosed with a black waterproof material. Here he keeps a number of metal trays filled with powerful chemicals, which, he explains, evaporate and act as powerful attraction to the moisture in the air. The secret of the chemicals used is of course his own, though he is glad to explain the nature of the reaction. "Often," he says, "there is enough moisture in the air to produce abundant rains, if only conditions were such as to attract them toward the earth. I have studied the conditions governing rainfall since I was a boy at school, and under the best conditions: years of residence in this semi-arid country. There is no magic in my method."

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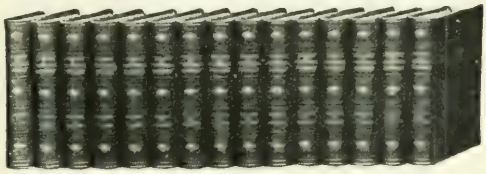

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REVOLUTION

WHEN Sir William MacKenzie, President of the Canadian Northern Railway, heard that strike organizers were at work among the construction gangs of his crews in the Rockies, he literally did not know who the Industrial Workers of the World—or the "I. W. W.'s," as they are commonly known—were, and is credited with having expressed absolute contempt for any action that could possibly come. Let them agitate their heads off! Let them strike till the crack of doom! He had no more love for the contractors than for the walking delegates. Let them dog eat dog and tear at each other's throats till nothing remained of either side! The railroad was paying the highest wages for unskilled labor, ($2.50 to $3.50 a day,) ever known in construction work. There would be no lack of laborers to come in. There were no grievances. The men presented no demands until after the walkout. The railroad thought it could defy all the walking delegates on earth and refused to listen to any advice about counteracting agitation.

Miss Agnes C. Laut.

At a word, at the drop of the hat one night, without any demands whatsoever of the contractors, 7,500 men stopped work. Every pick was dropped where last used. Not a wheel turned. Teamsters getting $3 a day and board turned horses loose and quit. Walking bosses at $5 a day stopped as readily as shovel stiffs at $2.75. It began at Ashcroft one night, the men crossing the river to the Canadian Pacific Railroad side of the narrow mountain canyon, marching down the Canadian Pacific Railroad tracks to all the Canadian Northern camps, pulling the men out of the shanty berths and practically sweeping every man off construction work for a distance of nearly three hundred miles—"a mania in perfect unison," as one observer described it. Men asleep down at Hope and Yale were wakened, told the strike was on, taken across the river and marched on down the river to the next camps. At a word, at a signal which Indians would describe as "a moccasin telegram," the walkout was complete from end to end of the line under construction. The thing was done without disorder and with almost military precision. On one side of Fraser Canyon are the Canadian Pacific Railroad tracks. On the other side sheer against the face of rock, tunnels and grade are being blasted and picked out for the Canadian Northern tracks. The men ferried across the river and took up quarters on the Canadian Pacific Railroad side, where a commissariat had been arranged and sleeping quarters were easily put up by the blanket gangs. In most of the camps were fifteen or sixteen different nationalities, men who had been in America only a few months and who had come from lands where the daily wage was from fifty cents to eighty cents a day.

After the walkout, a statement of grievances was drawn up. A minimum wage of $3 a day for a nine-hour day was demanded. The contractors had been charging the men $6 a week for

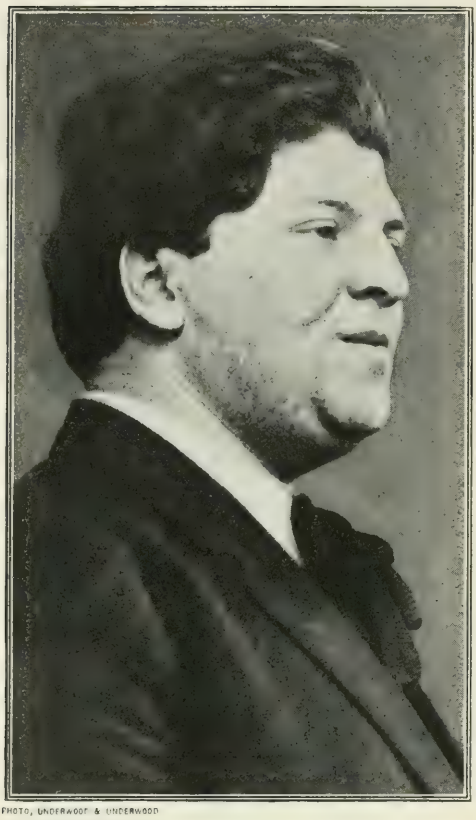
YAWNS ! By Agnes C. Laut

board. A reduction was demanded on this; and complaint was made of both the fare and the shanty camps. I may say I visited these shanty camps, and they were much better than many shanty camps where I have spent holidays. One of the chief complaints was against the piece-work system, or what is known as station work, where sections of tunneling and grading are let to subcontractors at a lump sum, the men buying the dynamite from the contractor and making profits only according to their own speed and judgment. Perhaps, too, luck plays an important part. One man may put in $10 of dynamite and bring down $1,000 of rock and gravel. Another man may put in $1,000 of dynamite and fail to blow out more than $100 worth of rock. On one bit of piece work, a man had left less than fifty cents for a week's work over and above board. On another stretch of station work, a gang of men from Montenegro, who worked well together, each cleared from $4 to $11 a day.

The railroad officials were first dumfounded; then, furious. Constables at a cost of $1,100 a day to the province of British Columbia were rushed in to prevent violence. Here, too, the strike was a new kind of demonstration in the annals of labor. *There was no violence,* no attempt at violence, except what the constables or contractors themselves perpetrated. The I. W. W.'s had appointed their own police, their own pickets, their own constables. Strikers were forbidden to take more than one drink in a day and a striker's constable

PHOTO, UNDERWOOD & UNDERWOOD

FACING THE BAYONETS AT LAWRENCE, MASSACHUSETTS.



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JOSEPH ETTOR—A STRIKE LEADER HELD RESPONSIBLE BY THE LAWRENCE AUTHORITIES, FOR THOSE SLAIN BY SOLDIERS' BULLETS.

stood on guard at each saloon to enforce the rule. A delinquent would be taken to the strikers' tents, tried, fined and relieved of his money. If perverse, he would be given commissariat duties till disciplined. Before the strike, the saloons had been taking in $300 a day; $1,200 on holidays. After the strike, the saloons complained to me that they could not sell a single drink. At one place, a compressed air pipe was blown up with dynamite and the news heralded through the press as "an outrage." As constables guarded both ends of the narrow canyon and the strikers were forbidden to cross the river, one can draw one's own inference as to the authors of that "outrage," and the motive. At another place, two or three strikers stood in the way of a construction engine driven by a non-union man. They—not the non-union man—were smashed to pieces; and in a strike that lasted for two months, those were the only acts of violence that are reported as having occurred.

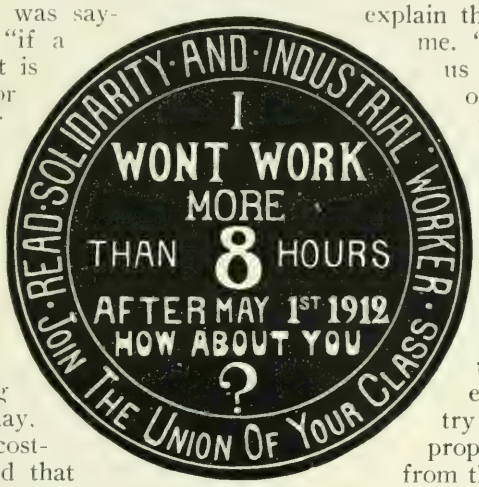
At a cost of $66,000 to the province, the constables waited for something to happen that would force a crisis. The strikers took good care that nothing happened. It was "the direct action" of what is called "passive resistance" with a vengeance.

The contractors rushed down to Vancouver, Seattle, Tacoma, hired new men, paid their way and put them on the train to go in to the construction camps. The new men, somehow, never reached camp. Shadows sat down in the train with them, and talked; and the newcomers dropped off and joined the strike camps.

This went on for two months. Then the railroad and the province and the public began to wake up from a hidebound indifference and ask questions. What kind of a strike was this, anyway, where no demands were made till after the walkout? Hadn't Canada the best arbitration law in the world? Why didn't they arbitrate? If each side denied there was anything to arbitrate, why not go back to work? Then, the public wakened up to the fact, it wasn't a strike they were dealing with, but a deadlock. A new era had come to the labor world, an era that repudiated arbitration and spat on the word "contract" and loathed compromise.

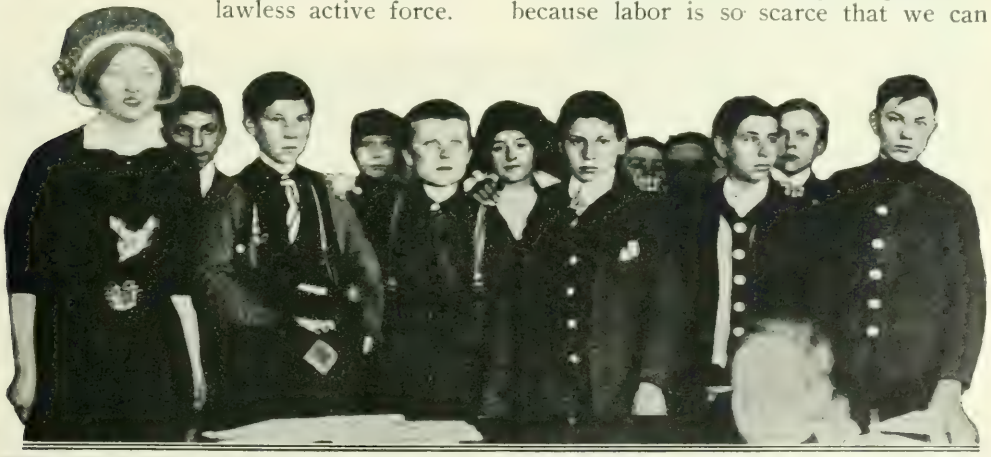
It was about this time that arrests for "unlawful assembly" and "free speech" began all along the Pacific Coast from San Diego to Prince Rupert; and in every strike center, two and three hundred strikers went cheerfully to jail. Three tiers to a cell they had them in British Columbia; and every striker, who went to jail, was paid $30 a month by his organization for his service to the common good. It was easy to make these arrests for unlawful assembly; for in order to hold their men together, the leaders nightly had concerts and speeches in their assembly halls; and with free speech among 7,500 men on strike, it is not surprising that cause for arrest could be found. Here, a man advocated "accidental slides of rock" down the embankment on the grade. There, another speaker advocated a cordial reception to non-union strike breakers. "Bring them to camp," he said. "Treat them well!

Give them a cup of coffee,' —a pause— "there may be something in that coffee—sugar of course." Where such speeches were made on the streets, and the police charged, there were, of course, riots. "Men," another man was saying, when arrested, "if a policeman taps me, it is the undertaker for him!" Well, two or three hundred of him *were* tapped in British Columbia, alone; but when the government learned that every man going to jail received $30 a month, that the keep of the men was costing the province $100 a day, that constables were costing $1,100 a day, and that the loss in wages had already amounted to $700,000—no more arrests were made. Down in San Diego, the hose was turned on strikers and the men were run out of the city. Up in British Columbia, the constables waited for the bread line to form one afternoon, and ran the men out mealless for a hundred and fifty mile tramp out of the country at the end of a gun. Both acts, I need not state, were utterly lawless. The I. W. W.'s had tried lawless passive force. The government had recourse to lawless active force.



WHY THEY ARE KNOWN AS "I WON'T WORKS."

"They think they have us beaten," said one of the leaders, who had escaped with the account books through a back window into the woods and had come to the hotel after the constables were in bed to explain the men's side of it to me. "They think they have us beaten; but we have only begun. We are not striking for this, that, or the other little paltry request as to hours and wages. We are striking to educate the workers to their power—to show them if they unite that they can paralyze every wheel of industry and compel the expropriation of all industry from that side of the line to this side of the line: from capital to labor. That is where our organization differs from all other organizations. You think we are beaten? We will go back to work and accumulate funds; and strike again; and strike yet again, till the public finds it cheaper for us to operate all industry than to tolerate the recurring deadlock. We are striking solely to overthrow the capital system. First, in England, it was the railways. Then, it was the coal mines. Now, it is the docks. Here we have begun operations because labor is so scarce that we can



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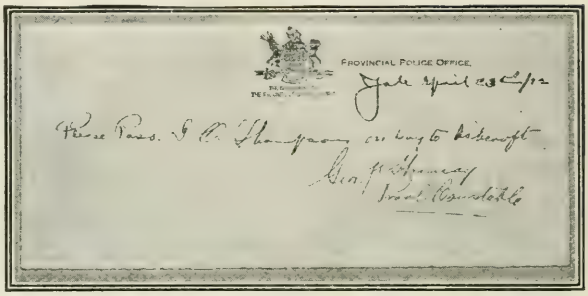
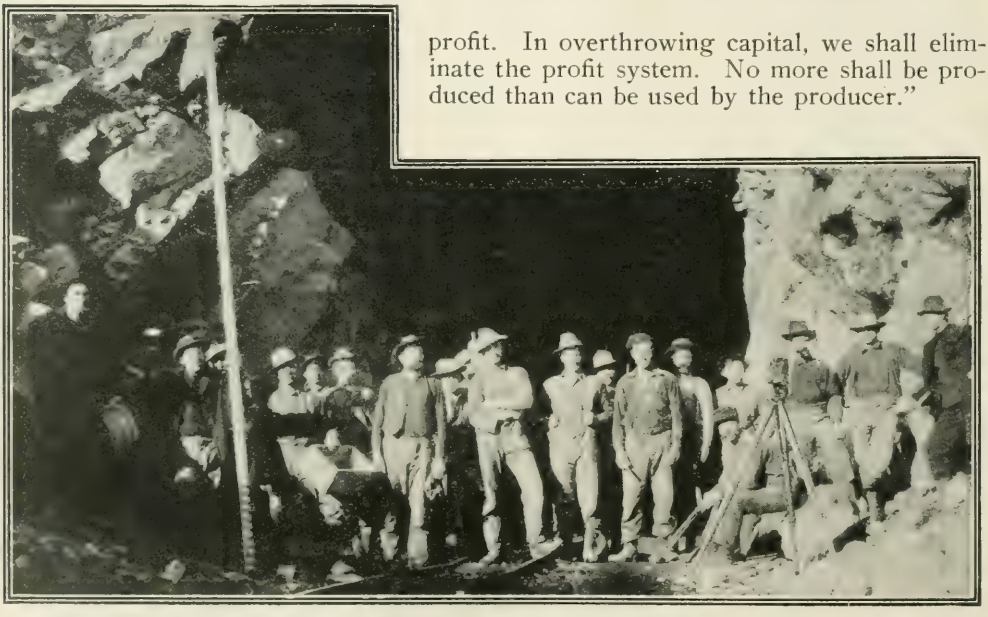
CHILDREN FROM LAWRENCE, AT THE TIME OF THE STRIKE IN THE TEXTILE MILLS, TELLING THEIR STORY OF HARDSHIPS ENDURED TO THE CONGRESSIONAL COMMITTEE AT WASHINGTON.

show our power. We have tied up one road for two months. Next time, we'll tie up three roads for three months; and so we'll go on and educate and educate and educate labor to a knowledge of its own strength and solidarity till it realizes it has only to unite in order to take over all industry and overthrow the capital system. Of course, I will be pinched when I go out tonight; but that is nothing. What is one man's loss in a great fight? There are thousands ready to take my place; and there will be ten thousand ready to take their places. We can fill their jails to overflowing. They will find it cheaper to make terms with us than fight us. 'I Won't Works' they call us. They are right. The Industrial Workers of the World are 'I Won't Works' for capital. We work only for the laborer; and the laborer is worthy of his hire; and our hire is all that labor produces: not just half of it, with the other half going for profit. In overthrowing capital, we shall eliminate the profit system. No more shall be produced than can be used by the producer."



SUCH A THING AS FREE PASSES FOR TRAVELING ON CANADIAN HIGHWAYS WAS NEVER KNOWN BEFORE.

HERE STRIKERS HAD A CAMP FIFTEEN HUNDRED STRONG, BUT WERE "RUN OUT" BY BRITISH COLUMBIA CONSTABLES.



TUNNEL WORKERS AT YALE, BRITISH COLUMBIA.

AN ASSEMBLY OF THE I. W. W.'S ON A STREET CORNER IN ABERDEEN, WASHINGTON.

"We are only six years old as an organization in this country," said an I. W. W. leader to me, in another of the strike camps. "We are only six years old; and we are one hundred thousand strong on the Pacific Coast, and five hundred thousand strong in Europe. We are the foundation layer of the industrial world, the shovel stiffs, the mill hands, the dock workers, the section men. How long do you think the world could go on if we stopped? It would paralyze every wheel of commerce. That is frankly what we aim to do—to refuse work till all industry is taken over by the laboring classes."

I did not answer that I did not agree with him and thought that the course outlined meant the precipice. I was keen to get the frank expression of the point of view of this new attitude on the part of the striker. In the I. W. W. Hall on Cordova Street in Vancouver, I was amazed to find lists of subscriptions to the strike fund from Hindu and Japanese sympathizers. The impression has always been that the labor unions are behind the opposition to oriental immigration.

"Don't you object to those fellows coming in and cutting your wages?" I asked.

"Not in the least," he shot back. "It is the spineless middle class who object. No fear of the Hindu being allowed to line up with capital. We recognize neither creed, color, nor flag. Let them come in. They will swell our ranks. We have our revolutionary agents busy in India, too. We aim to unite the laborers of all the world against the capital of all the world. No more craft competition. No more cutting of each other's throats because of a difference in the color of the skin. Let them come in; and they will organize with us!"

I had remarked to another leader that I did not think their secret propaganda would ever succeed in the factories of Eastern Canada because of the operatives being French Canadians and the Catholic Church opposing secret orders.

"You don't, don't you? Then let me tell you there is not a railway yard nor factory from Montreal to Vancouver, from Lawrence in New England to San Diego, California, where we have not our secret agents organizing. Who organized and won the Lawrence strike? Who organized the New Jersey railroad strikes? Who set the ball rolling in San Diego and Vancouver? You put your finger on any point on the map; and I can tell you of our organizer there. You know what happened in Lawrence?"

I did. When the troops, who charged the strikers, went back to their quarters, they found that secret members of the I. W. W. in the Army had thrown all their belongings out in the snow.

It is curious how slow the public have been to realize that the I. W. W.'s are a new force in the labor world. Arbitration, the ballot, compromise, profit sharing, contract—all are excoriated, despised, repudiated by the newest labor movement. "Discontent," "expropriation," "revolution," are the watchwords.

Ten years ago, Mitchell and Gompers were popular idols. Today, their names are spat upon. "These vultures," declares one I. W. W. manifesto, "are doing the bidding of the master class! Upon them falls the awful curse of a world of millions! They have made America the land of lost strikes. These traitors betray the proletariat!"

"We do not want," says another manifesto, "to build a job trust," (speaking of the old trades unions,) "we aim at a *big all inclusive labor trust.*"

"Listen men, the day is once more at hand when treason is the supreme duty of every man and mutiny a soldier's highest obligation."

"We advocate doors wide open to *all* wage workers, whether white, yellow, red, brown or black. The I. W. W. stand for no country but the world, no interests save those of the toiler."

"In cases of dispute," advocates another manifesto, "remain at the post and turn out work in such shape as to be unfit for sale. The more skilled the workman is, the greater his knowledge of how to spoil work without being detected. . . ."

"The general strike of all labor is nothing less than the Social Revolution at which we aim. It begins lawfully without any danger to workers."

"Don't you fear to overthrow a civilization that it has taken the world billions of years to build up?" I asked one leader. "Why not remove the evils, instead of smashing everything over a precipice and building up on ruins?"

"Fear? What have we to fear? It's the middle class have everything to fear. We have nothing to lose. Let the smash come!"

"Instead of revolution, why don't you

STRIKE!

The Construction Workers of the Canadian Northern having been goaded on to a point of desperation by the low wages, the outrageous prices charged for the necessities of life and the unsanitary conditions which force the workers to sleep huddled together like rats, in places unfit for human habitation, where a window is considered a luxury and where stinking mud constitutes the floor, many workers falling prey to fever, epidemics, and receiving inexperienced attention when taken to the hovels known as hospitals, for which $1.00 per month is charged—have at last risen in Revolt. Seven Thousand Workers, solidly organized in the Industrial Workers of the World, are on strike, demanding a living wage and better conditions. All Workers are requested to stay away from this struggle and by so doing help their fellow workers to fight organized Capital.

All who disregard this notice will be considered traitors to and enemies of the Working Class. The following demands have been drawn up by the Workers:

That Nine Hours shall constitute a maximum day's work, and Three Dollars per day shall be the minimum day's wage for all Common Labor

That all Tunnel Workers shall be considered underground workers and as such, Eight Hours shall be their Maximum day.

That the Board shall not exceed $5.25 per week, or 25 cents a meal.

That the Sanitary conditions of the Camps be looked into.

That Steam Shovel Crews remain as before, for a Nine Hour Day.

TUNNEL MEN	
Timber Framers	$ 4.50
Machine Men	4.00
Heading Men	3.50
Bench Men	3.25

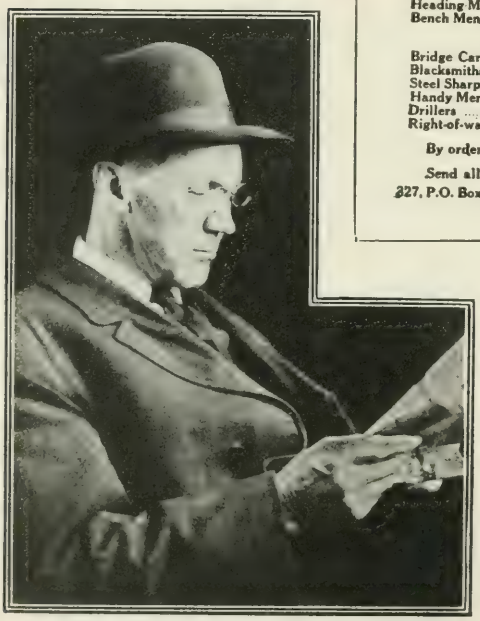
OUTSIDE MEN	
Bridge Carpenters	$ 4.50
Blacksmiths	4.00
Steel Sharpeners	3.50
Handy Men	3.50
Drillers	3.25
Right-of-way Men	3.25

MONTHLY LABOR	
Cooks up to 50 men	$ 90.00
Cooks up to 100 men	100.00
Cooks up to 150 men	110.00
Cooks up to 200 men	125.00
Second Cooks	75.00
Bakers	80.00
Flunkeys and Bull Cooks	50.00
2 Horse Teamsters	50.00
4 Horse Teamsters	60.00
6 Horse Teamsters	65.00
8 Horse Teamsters	70.00

By order of Central Strike Committee, Local Union 327, I. W. W.

Send all funds to Maintain Strikers to Thos. Whitehead, Sec.-Treas. L. U. No. 327, P.O. Box 35, Lytton, B. C.

THIS WAS ISSUED AFTER THE WALKOUT



DR. HERMAN F. TITUS, A SOCIALIST AGITATOR AND I. W. W. WORKER OF THE NORTHWEST.

CONSTRUCTION WORK—SPENCES' BRIDGE—ON THE LINE OF THE CANADIAN NORTHERN.
It was necessarily dangerous work in which six lives were lost ferrying machinery across the wild tracts of Frost Canyon.

try evolution?" I asked another. "Why don't you use the ballot? It takes only three years for a worker to get his papers in Canada. Why don't you use the ballot as the Socialists advocate?"

He pointed from the office, where we were sitting, to the outer hall where foreigners of eighteen different nationalities were coming and going in a babel of tongues. "You know what the politicians do with those sorts of voters," he said. "The ballot has been stolen and corrupted and devised into a cheat to deprive men of self-government. Capital has corrupted the ballot box. Capital has taught us the lesson of coercion; of direct action; of keeping within the law and defying the law. Now we are practicing the lesson our masters have taught us. No—we do not advocate violence or lawlessness. That would be foolish. We shall keep within the law, as capital does, and fool the law as capital does, by persistent, insistent, passive resistance."

Was the I. W. W. leader right? Has the corruption of the ballot begun in Canada, too? For years, Canada has assumed an I-am-holier-than-thou attitude to matters American, both political and financial. You see it reflected in the columns of the press every day of the year; and if you want to put one of my countrymen in fighting mood on the instant, just suggest that the Canadian courts are not spotlessly above reproach! Is the ballot being corrupted in Canada, too? Let a statement of fact answer that question, rather than argument. A few years ago, a provincial election promised to be very close in the West. In one city is a solid square of twenty thousand foreigners. In a certain block, which I can name if chal-

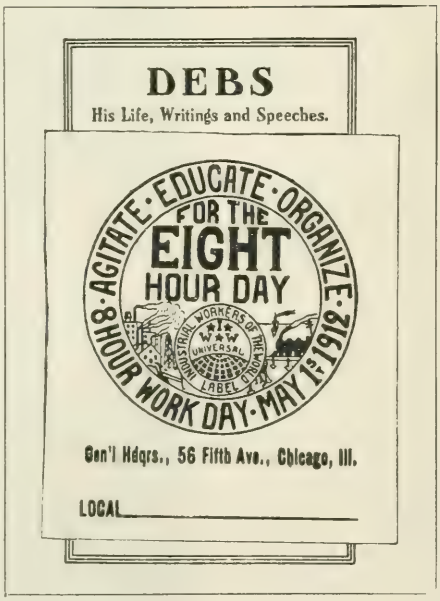
TUNNEL MEN ON PIECE WORK AT YALE, B. C.
The men buy the dynamite from the contractor. Profits to the workers depend upon their own speed and judgment and luck.

HEAD OFFICE OF I. W. W. STRIKE CAMP AT YALE, B. C.

WOMEN TOOK AN IMPORTANT PART IN THE DISTURBANCES AT ABERDEEN.

lenged, there gathered together party manipulators; and in one week there were turned out in the same signature of all the names papers of naturalization for three hundred foreigners, who could not speak, read, or write one word of English. Now a foreigner must have resided in Canada three years and have two witnesses that he has done so before he gets his papers; so that these three hundred forgeries also represented three hundred perjuries. All this is not the end of the story. The opposition party were so furious at the swindle — so furious, too, at the defeat — that they sent proofs and papers of the corrupt practices down to the Department of Justice in Ottawa for action. It was during the Laurier régime; and as the authors of the trickery were Conservative party heelers, it was not party feeling that restrained justice. People on the inside waited for the explosion. The explosion never came. Why not? Because one party said, "If you go after us for this, we'll go after you for that." And lo, silence fell! There was neither exposure nor punishment. Was the I. W. W. man right? Is it the dishonesty at the top that reacts in the shifting of the very foundation pillars of industrial life?

"I have a pamphlet of yours advocating a three-hour day," I said to another of the leaders. "You call for a nine-hour day, now; an eight-hour day tomorrow; a seven-hour day, next; and so on, down and down, to three hours of labor a day; and I understand one of your street agitators now serving sentence in New Westminster prison advocated $4 an hour for a three-hour day. Now, you could not work that scheme in your own household. Try it with your wife. She rises at six and quits at nine. You would need extra help from nine to twelve, and twelve to three, and three to six, and six to nine. We'll, suppose in reconstructed society, you get $4 an hour for a three-hour day, or $12 a day. To run your house, not paying anything to your



DEBS' ADVERTISING COVERED BY I. W. W. POSTERS.
Debs together with union leaders is repudiated by the I. W. W.'s.

Our Motto: "WE NEED THE MONEY" (Issued under illegal Ordinance No. 23)

Catchem, Fakeum, Skinum and Shipum Employment Assassination

(Wholesale & Retail Dealers in Hungry Slaves).

(Men to Break Strikes a Specialty).

Received of **MR. JOB HUNTER,** the sum of $1.00 for which we agree to give you correct information, by which you shall be enabled to secure a position as a **SAWMILL LABORER** with **WORKEMHARD & STARVEM LBR. CO.,** at Gray's Harbor to break the Millmen's strike, on order. Wages $2.25 a day, ten hours. **Board $5.00 a week** (bum grub). Hospital $1.00 a month. **(Pills for all Pains).**

If you don't get this promised job, we refund the money, like H.....

(Catchem, Fakeum, Skinum and Shipum Emp. Ass.)

TO EMPLOYERS:..Send all your orders for men to us, to break the Millmen's Strike at Aberdeen, Raymond, Tacoma and elsewhere. We are in the business, to help you break the Strike, and overflow the Country with lots of hungry men, so you can get them to work for almost nothing.

Try our Old Glory Breed of easy marks, who work hard, eat any old thing, sleep in lousy bunks and never kick.

ISSUED BY THE STRIKERS' AGENTS TO ALL NEW COMERS.

wife, you would need an income of $48 a day for labor alone, not counting food and clothes. If you cannot work your new industrial scheme out in your home, how do you expect to work it on the nation and the world?"

"My wife is my partner," he answered: "and that is what capital will be to labor when the new régime comes. We demand such hours and such pay solely to transfer capital from that side of the line to this side of the line—to overthrow the capital system, as democracy overthrew feudalism."

"But I love work," I answered, "and thousands of people do. We don't want a three-hour day for our own affairs. Supposing that I wanted to work sixteen hours a day, as many people whom you call 'capitalists' do work every day of their lives; supposing I want to earn $64 a day to your $12, why should your new system of utter freedom prevent me or anybody else?"

"For the good of the labor world—to prevent a capital system ever growing up again."

"And you would forcibly prevent it, as this pamphlet advocates, you would exile me from your new nation if I worked more than three hours a day?"

"We forcibly would, just as the pamphlet says; but you forget that in a society where there would be no rent, no interest, no dividends, no surplus products, you would have no motive to amass $64 to my $12."

That is, the reconstructed society is to have no conception of the joy of work for

DEMONSTRATION OF I. W. W. FORCES AND ALLIES—"ALL LIBERTY-LOVING PEOPLE"—FOR FREE SPEECH IN VANCOUVER, B. C.

AN ADVOCATE OF FREE SPEECH ARRESTED FOR EXERCISING WHAT HE BELIEVED TO BE HIS RIGHTS, AT VANCOUVER.

its own sake. It is to substitute one kind of force for another. I have no comment to make; but with this frank expression of the I. W. W. aims and methods, the East can understand why there can be no compromise on either side; why both sides go into a blind fury at the very word compromise. But do not mistake the force of the movement! It is not a local labor fray. It is a world war that aims to make the French revolution look like petty politics. Ask an I. W. W. man what the continual sporadic strikes of the last year mean; the rail and coal dock strikes in England; the construction and dock and smelter and mill strikes in the United States, and he tells you frankly, without mincing matters, that all the little strikes are to educate the workers up to the Big General Strike; and the Big General Strike is to be the Revolution, bloodless if possible, bloodless if the armies of the world can first be won over; but if not—then, their manifesto says,—and there is a terrible menace hidden behind that one word—"forcibly."

Biblical Wisdom

¶ Whoso findeth a wife findeth a good thing.

¶ He that increaseth knowledge, increaseth sorrow.

¶ He that repeateth a matter separateth very friends.

¶ The Sabbath was made for man and not man for the Sabbath.

¶ My desire is . . . "that mine adversary had written a book."

¶ As the crackling of thorns under a pot, so is the laughter of a fool.

¶ A continual dropping in a very rainy day and a contentious woman are alike.

THE WIRELESS ERA WILL CREATE A STATE LIKE THE SOCIALISTIC DREAM.

MARCONI'S PLANS FOR THE WORLD

By

IVAN NARODNY

"WITHIN the next two generations we shall have not only wireless telegraphy and telephony, but also wireless transmission of all power for individual and corporate use, wireless heating and light, and wireless fertilizing of fields.

"When all that has been accomplished —as it surely will be—mankind will be free from many of the burdens imposed by present economic conditions.

"In the wireless era the government will necessarily be the owner of all the great sources of power. This will naturally bring railways, telegraph and telephone lines, great ocean-going vessels, and great mills and factories into public ownership. It will sweep away the present enormous corporations and will bring about a semi-socialistic state.

"I am not personally a socialist; I have small faith in any political propaganda; but I do believe that the progress of invention will create a state which will realize most of the present dreams of the socialists.

"The coming of the wireless era will make war impossible, because it will make war ridiculous.

"The inventor is the greatest revolutionist in the world."

The man who made these startling predictions is not a visionary, but one who already has to his credit one of the greatest material achievements of modern times—Guglielmo Marconi, the inventor of the wireless telegraph.

I was talking with the wizard about his great invention, and I listened enraptured as he opened up before me his plans for the future development of the wireless idea.

Marconi is a man of medium height and, though of a nervous and highly-strung temperament, he remains cool and deliberate in his manner. Unlike the

GUGLIELMO MARCONI.

He believes that, through wireless, eventually "mankind will be free from many of the burdens imposed by present economic conditions."

inventor of tradition, he is fashionably dressed and has the appearance of a member of the leisure class of society. He assured me that he had never written a line for any publication; nor taken part in any scientific dispute. Though born at Bologna, in Italy, thirty-seven years ago, he speaks English as perfectly as he does his native tongue. His blue eyes, light hair, and fair complexion give him more the appearance of an American than of an Italian. When he was nineteen years old he began the experiments which culminated in his discovery of the wireless transmission of electric energy.

"At twenty-one I came from Italy to London and convinced the British Post Office Department of the practicability of my invention," said Marconi, "and at twenty-three I had already made my reputation.

"In August, 1898, I was invited to install my wireless system between the Royal yacht *Osborne* and Osborne House, Isle of Wight. The late Queen Victoria wanted to communicate with the then Prince of Wales, during his cruises in Cowes Bay and the Channel. When the Prince of Wales sent the first message to the Duke of Connaught, he asked me if that was the very first ever sent from English soil. 'Oh, no, Your Royal Highness,' I replied; 'The first message from the English soil I sent to my aged parents to Italy,' and the prince shrugged his shoulders.

"That was amusing, dramatic, too, in a light comedy way. It stands in sharp contrast with another experience I had—that of sending the first message across the Atlantic. This was on December 12, 1901. The mere memory of it makes me shudder. It may seem a simple story to the world, but to me it was a question of the life and death of my future. I have never told the story before for publication."

Mr. Marconi paused as if grouping the facts in his mind, and continued: "I landed quietly on December 9, 1901, at St. Johns in Newfoundland with my two assistants, Mr. Kemp and Mr. Paget, and set my instruments in a low room in the old barracks of Signal Hall, which stands about half a mile from the town of St. Johns. Nobody knew of my plans and arrival, for I intended to make the experiment without any great attention. I was not skeptical about the possibility of the feat, but I was afraid that some technical imperfection might ruin the whole experiment. Before leaving England, I had instructed my assistants to send me a certain signal at a fixed time each day. This signal was to be sent out from Poldhu, Cornwall, the most southwestern end of England. The question was: Could I receive on my kite-wire in Newfoundland some of the electric waves produced in England? It was a distance of two thousand miles. I had cabled my assistants across the water to begin sending the signals on December 12, at three o'clock, p. m., in England, and continue until six p. m., which hours correspond to about 11:30 to 2:30 o'clock in St. Johns.

"On Thursday, December 12, I filled a fourteen-foot hydrogen balloon and sent it up through a thick fog. We succeeded in holding it up at an elevation of about four hundred feet and I prepared myself for the crucial test.

"At noon I was waiting with a telephone receiver at my ear, my heart beating rapidly. I used the telephone in my experiments merely to hear the slightest clicking of the regular receiving instrument. On the table before me lay the sensitive receiving instrument — the crown of all my labors and triumphs. A wire connected it with the kite, which could be seen swaying high in the air. It was rather a rough and unfavorable day for an experiment. When I listened to the monotonous roar of the ocean at the base of the cliff, and gazed out over the waste of water eastward and thought of the two thousand miles of distance, my heart grew heavy. The coming of a mysterious message seemed almost impossible. Yet my faith was unshaken.

"I remained waiting an hour without a sound, except the roaring sea, to break the silence. Then suddenly I heard the tapper as it struck against the coherer. I listened, my hand trembling with excitement. A few minutes pause, and again I heard, faintly yet distinctly, the three low clicks, signifying the letter S. in the Morse telegraphic system. My assistants, Mr. Kemp and Mr. Paget, were in the other room and, unable to control myself, I exclaimed: 'Gentlemen, did you hear it?' The question was solved

Lighting Vast Cities by Wireless.

and I experienced a feeling of the greatest joy. Half an hour later other repetitions of the signal were received. As it was windy the kite swayed so much in the air that the receiving wire was not maintained at the same altitude, as it should be, therefore the experiment was more than successful. When I walked down the hill toward the city I felt proud of having wrought the greatest wonder of electrical science.

"Although most people know about wireless telegraphy and admit the possibility of wireless transmission of sound and energy, yet they do not seem to understand the fundamental principles of this, perhaps, most revolutionizing invention of the age. Wireless transmission is nothing more than a certain vibration of the ether. In the ether, when it is carrying the wireless message, a sort of invisible earthquake is set up. Etheric vibrations of four hundred billions of waves in a second produce red light, twice as fast violet, but vibrations of two hundred millions in a second produce the waves that carry the wireless message. The static electricity of the ether is energized by the oscillating current sent up and down by the aërial wire of the wireless telegraphic instrument and is diffused through space. The power of this is supplied by an ordinary alternate-current generator, having an output of thirty kilowatts, with a voltage of about two thousand. By means of special transformers and condensers, the electrical pressure is increased to fifty thousand volts, or even more. The terminals of the transformer are connected with two metal spheres, one of which is connected with the perpendicular wires and the other with the ground. On the circuit being closed the spheres become charged. The discharge of those spheres is oscillatory and they radiate electrical waves in the ether in all directions. Some of these vibrating waves dash across the space to the corresponding station, where they strike wires in connection with the receiving instrument. A simple illustration of the action of these ether waves is that of throwing a stone into a placid lake. A series of ripples is created which spread out in circles. Any small piece of wood which may be floating upon the surface will bob up and down in each consecutive ripple. This is the principle of every wireless transmission, be it dispatch, sound, heat or energy. The difference is only in the length of the wave and the velocity of its oscillation.

"It seems as if it would be possible for every one who puts up a receiving station to catch the wireless energy and thus to easily steal it. More important than that which presents itself to those who make use of these waves for messages will be the problem to those availing themselves of wireless for light and dynamic power. But this is easily prevented by tuning the waves so that they can be received only by a corresponding coherer. If the transmitter is sending

out one million five hundred thousand waves in a second, they can be received only by an instrument of corresponding construction.

"In one of my experiments I had connected three receivers with a single wire, but they were all tuned differently to transmitters, of which one was in Germany, one in France and one in England. The three transmitters sent three different messages, one in German, one in French and one in English. The dispatches were received simultaneously without any interference. This is striking proof of how easily electric energy without wireless transmission can be managed.

"No invention has had directed against it a more bitter opposition than has wireless telegraphy. There have been directed also widespread jealousy and animosity against the inventor. I have been attacked most aggressively in every possible way by people who are afraid of my revolutionizing invention. The reason for this is very simple. About four hundred millions of dollars are invested in cable systems in various countries of the world and twice as much in land wires. As soon as my wireless system succeeds the vast network of cables and wires will become useless and the money invested in the old system will be simply thrown away. It is a vital point for those companies that have invested in the old system and they are making me now every possible trouble.

"A cable across the Atlantic costs four million dollars and requires constant repairs. But I can equip stations on both sides of the ocean for less than one hundred and fifty thousand dollars. The subsequent expense of maintaining these stations, as compared with the cable systems, would be very small. I would be able to transmit with one instrument about twenty words a minute and I can have a hundred or more instruments working from the same station. A word sent by cable now costs twenty-five cents. I would be able to send a word for three or perhaps two cents. The difficulty with a bigger commercial use of my system has been merely the scarcity of wireless stations throughout the country, here and in Europe. It is true, that there are many companies competing with mine, all working independently. I think it is only a matter of time, however, when they will be all consolidated into one international wireless union.

WIRELESS MAY EVEN FERTILIZE THE SOIL.

A step further in the progress of wireless stands wireless lighting, heating and transmission of motor power. Each of these systems is based on the same principle as wireless telegraphy, only the transmitting and receiving instruments are different and the vibrations of the etheric waves have a different nature, intensity and length. The so-called high-potential magnifying transmitter is the instrument to be applied in these new wireless systems of electric energy. This creates a freely vibrating secondary circuit, from which one end is connected

with the ground and the other with an elevated conductor. I suppose currents of one thousand amperes and fifteen to twenty million volts will be necessary for producing these waves and for the receiving of them by the consumers.

"The generating terminals of the wireless energy will have to be owned by the State governments. The waves will be sent out to the consumers in various degrees of power. Some of the waves will be utilized for dynamic purposes, others for lighting, heating, fertilizing and, possibly, for military purposes. Water and wind power, possibly light, also, will be used for generating purposes in the huge national power-stations. As an example, take Niagara, the water power of which is owned by New York State. Say, for instance, that Niagara would be able to send out every hour one hundred and fifty million horsepower in electric waves, that twenty millions of it would be used for mills, shops, railways, traffic in the cities, and for household purposes, that ten millions would be consumed for lighting and thirty millions for heating and fertilizing within the boundaries of the State. There would then remain eighty million horse-power that could be sold to other States. It would seem at first glance as if the owners of receiving stations outside of New York State could easily steal the energy of Niagara for whatever purpose they wanted it, without payment. But this will be impossible, for in the first place, the waves of various degrees will be so tuned that only corresponding receivers can use them and these receivers will have to be recorded by the municipalities, and in the second place, every user of wireless energy will be obliged to use a meter, like the present gas-meter. Motor waves, for instance, will have two million vibrations, and forty million volts, the light waves measure slightly less and the fertilizing waves still less. All the generators of energy in New York State will be exactly of the same degree. If this New York wave should overload Pennsylvania and Massachusetts, it could not be utilized there, because all the receivers of those States would have their individual tuning, different from New York. But New York State knowing that it could spare eighty million horse-power as the surplus of what it created might agree to sell it to Pennsylvania and Massachusetts, or any other customer for a definite price. Consequently those States could have certain accumulators which would receive the rest of New York's electrical energy and transform it to the same measure of waves used within their borders. By this method it will be much simpler to handle wireless energy than steam and electricity in their present form.

DYNAMIC POWER MAY BE TRANSMITTED THROUGH THE AIR WHEN MARCONI'S WIRELESS DREAM COMES TRUE.

"As soon as the use of wireless energy becomes universal it will necessarily sweep out all the present privileged corporations of power and create a semi-socialistic state of affairs. In the future the government will be the owner of all energy. Individuals will use it to a certain amount free of any charge, but for the rest they will have to pay for the state a definite tribute. This will naturally make railways, telegraphy, telephone, vessels and mills a public ownership. There remains opportunity for an individual under those new conditions. The main trouble with all the today's economic friction is that the energy can be owned by certain privileged individuals, who use it for their own selfish ends but not for the benefit of humanity."

AN OLD VIRGINIA MANOR HOUSE.

GOING SOUTH

By

HENRY M. HYDE

WHEN the old farm gets to be worth one or two hundred dollars an acre, the temptation to sell out and become a plutocrat is often irresistible. Presently, perhaps, the old lust for the land grows hot again in father's blood, or Tom, the oldest boy, expresses a wish to get back between the plow handles on a farm of his own.

Where to go, then? Where shall one find cheap lands, good markets and other favorable conditions? Many enterprising farmers of the Middle West, turning their fat black farms into ready money, have swept North across the border into Alberta or Manitoba to glut themselves with square miles of untouched, virgin prairie. They have made the glorious Fourth a recognized institution in Western Canada and added millions of bushels to the world's wheat crop. But one pays the price even for free and fertile acres when they are covered with ice and snow for half the year. And there are plenty of men to whom the flag of stars and stripes, flying unvexed in the free winds, is still an essential feature of the daily landscape.

Irrigated farming on the plateaus and benches of the far West and Southwest offers one solution of the difficulty. But the irrigation farmer must have abundant capital; the conditions of his work are entirely new and different; often he is far from a good market; to the man used to

THE WIDE LAWN OF A VIRGINIA FARM

the wide-stretching prairies of Iowa the intensive cultivation of forty acres under water seems a small and disagreeable business.

There remains another way out. In the old South Atlantic and Gulf States there are millions of acres, practically untilled since the war, on which the application of the new methods of scientific farming will produce most satisfactory results. Many of these farms are naturally fertile. Devoted year after year to the half-hearted cultivation of cotton or tobacco or left to lie fallow, they wait only the coming of the skilled husbandman to renew their fertility.

In almost any part of the South these neglected farm lands can be bought for a tenth of the price charged for Illinois and Iowa prairies. They offer mild and clement winters and a growing season months longer than that of the West and Northwest. Middle West farmers, knowing the increasing difficulty of getting sufficient farm labor at any price, see even in the negro problem certain compensations, when it enables them to command abundant and at least fairly efficient labor—used to working long hours —at one dollar the day.

The wise man who declared that the South is the new West is still in harness. The new army of invasion from the North and West which is sweeping again over the South has barely begun its march. But already the effect is noticeable. In widely separated parts of the country, unsuspected or only partially understood resources are being rapidly developed. Down along the Texas littoral, hundreds of farmers are making big money in the cultivation of onions and other vegetables. On the Grand Prairie of Arkansas the rice growers are creating a new and immensely profitable industry. In Florida—latest victim of unscrupulous land agents—thousands of Northern people have been sold little patches of land. Many of them will be disappointed, but enough will remain to give fresh impetus to the growing of citrus fruits and truck-raising for the Northern markets. Down in Virginia there is a single field of alfalfa covering three hundred acres which yields its fortunate owner an annual cash return of eighteen or twenty thousand dollars. All along the Piedmont plateau and in the mountain coves of the Blue Ridge commercial apple and peach orchards are coming into bearing which produce fruit rivaling in quality the fancy pick of the most famous Pacific valleys. The average yield of corn per acre in the Carolinas is greater than in any of the corn belt States. In a hundred places and in a score of different directions the South is demonstrating that its agricultural possibilities are at least as great as those of any other part of the country have proved themselves to be.

In addition to its fertile soil and its clement climate the South has other unique advantages to offer which make a strong appeal to the Northern and Western farmer. In response to this appeal the tide of immigration is reversing itself. Visit almost any Southern county seat and one is likely to meet men from Illinois, Indiana, Ohio or even from beyond

HOUSE IN THE FOOTHILLS OF THE BLUE RIDGE.

the Mississippi come to spy out the land and find places for settlement.

By writing to the Agricultural Department at any one of the State capitals, the prospective settler can get, free of charge, a handbook descriptive of the State's agricultural development and possibilities. After making a proper allowance for the exaggerations of local pride, the handbook will give him a good idea of the conditions and the opportunities which the State offers him. Most of the State Commissioners of Agriculture are also glad to send to inquirers a more or less lengthy list and descriptions of farms for sale. In this way one can get, before starting on a trip of inspection, a fairly clear notion as to which locality is likely to please him best, both as to prevailing crops and to the prices of farm lands. And as the railroads have long made cheap home-seekers rates for excursions to the West, they now offer similar round trip tickets to any of the South Atlantic and Gulf States.

Perhaps the situation may be best illustrated by a description of conditions in a single county—Albemarle—of central Virginia. Here is a land of high hills and deep valleys, running up at the west into the wooded peaks of the Blue Ridge. The best soil is a bright red and through almost every field runs a "branch" of clear water. It is a country rich in historic traditions. The homes of two of the early presidents lie within its borders, and that of a third just outside, while the only living ex-president has a summer lodge in its Green Mountain section. Tarleton's dragoons invaded Albemarle during the Revolutionary War; several regiments of captured Hessians were imprisoned here until independence was acknowledged. Sheridan's raiders swept through the county from one end to the other during the '60s. Charlottesville, its county seat, is the home of the University of Virginia, the alma mater of most of the Democratic statesmen who are now running Congress. Edgar Allen Poe was another son of the University and the scene of one of his famous tales is laid in the Ragged Mountains which stretch in a high ridge across half the county. The farm houses are built on high knolls, wooded with splendid trees and looking out over wide and broken landscapes, which nature has painted from a most richly colored palette.

The most practical and thrifty of Western farmers must not object that these considerations are not pertinent. For—on the authority of Country Life Commission—the greatest need of farm life in America today is more comfortable and attractive conditions of country living. And, if the Western farmer can teach his Southern brother something of the science of agriculture, he can, at the same time, learn from the native the charm of easy and gracious manners and of a simple and sincere hospitality.

In the South the man who owns and tills the soil has always been looked upon as the only real and natural aristocrat. The goal of Southern ambition is still the ownership and cultivation of a fine plantation. "Hayseed," "rube" and "country jake" are terms of reproach never heard South of the line. City dwellers are

pitied as unfortunate people whom hard circumstances have driven to live an unnatural and uncomfortable life. Social life in the country has been developed more than in any other part of the Republic. To keep the boy contented on the farm it is only necessary to give him a working knowledge of scientific agriculture and to conform to already existing standards of living in the farm home.

Men coming from the North and West find the atmosphere refreshing. The mere possession of money counts for less than in almost any other part of the world. Character and personal attainments are still the standards by which men are judged. The South is not yet commercialized.

In the intervals between writing the Declaration of Independence, running the government and founding the Democratic party, Thomas Jefferson leveled off the top of a mountain in Albemarle county, built himself a brick manor house, set out plantations of trees, hemmed in his great lawn with hedges of box and set himself down to practice the oldest, greatest and noblest of professions. From his high mountain top he could look out over his thousands of acres, lying like a red and green checker board in the valleys below. Every morning the field hands started out in gangs from the slave quarters and all day Jefferson could watch them as they toiled in the distant fields of corn, tobacco and wheat.

Today Monticello, wrapped in its mantle of historic silence, stands deserted—but still impressive. The great Jefferson estate is split into many farms. The slave quarters are empty. And with the coming of the new century and the arrival of the advance guard of the new army of invasion a new spirit has come over the whole beautiful picture.

A man from Hood River, Oregon, selling his orchard there for sixty thousand dollars has bought the top and shoulders of a higher mountain, looking down on Monticello, cleared away the chestnut-oak, poplar and pine, and set out three thousand Winesap apple trees, with as many peach trees between the rows as fillers. Nor is this undertaking a rash experiment. For more than a hundred years the mountain slopes of the Blue Ridge and the coves and valleys between them have been famous for their apples. In the early '40s old Andrew Stevenson, then Minister to the Court of St. James, presented a barrel of pippins from his Albemarle estate to Queen Victoria. So tickled was the palate of the royal lady that she promptly removed the duty from the Virginia fruit and made the Albemarle pippin the court apple of Great Britain, a proud position which it still occupies.

Ever since then every farm in the county has had its orchards of apples, peaches and pears. Until the last few years the fruit trees have been left to take care of themselves. But the Southerners have been quick to catch the lessons painfully learned in the first place by the fruit growers of the far West. Gradually, as spraying, pruning and cultivation between the trees has become more prevalent, the value of the fruit crop has increased, until last year Crozet, Covesville and a couple of other small fruit growing stations in the county shipped about one hundred thousand bar-

FINE STOCK ON A SOUTHERN FARM.

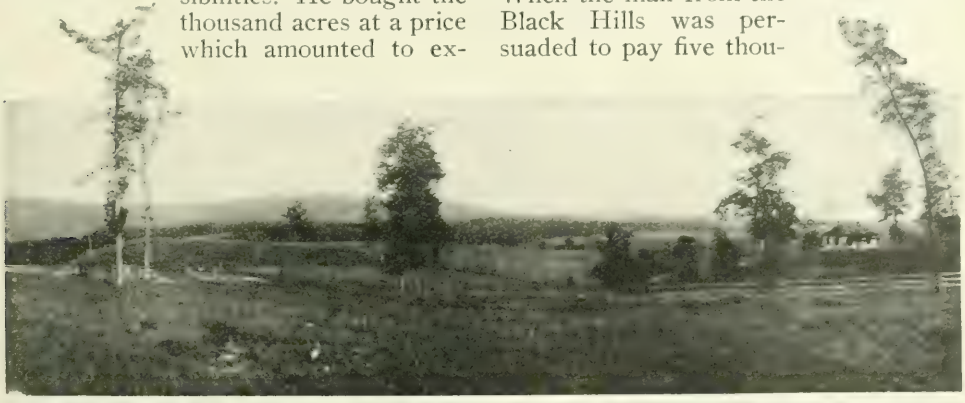
rels of apples to the Eastern cities, at a cost for freight of less than one-third the amount which the Pacific coast fruit growers are called on to face.

Other orchard men from the Pacific coast have also seen the logic of the situation and either bought plantations already in bearing or set out new trees of their own. They find it still possible to buy already developed orchards for less than the cost of the raw land and water in the irrigated country. With an equality, at least, in the flavor of the fruit, with a labor cost of less than one-half and with the great difference of freight rates in their favor, they laugh at threats of overproduction and declare that they will be able to make a handsome profit long after the fruit growers of the Pacific have been driven from the Eastern markets.

Five years ago a Wisconsin farmer, who, by applying intensive methods to a small acreage, had developed an extremely profitable property, sold the farm for several hundred dollars an acre and came to Albemarle. Seven miles from the county seat he found an old estate of more than one thousand acres which had been sadly neglected for years. Many of the fields were deeply gullied and galled. The old brick house stood on a high knoll surrounded by forest oaks and great chestnuts and looking out over woods and mountains. Less than one hundred acres were under any pretense of cultivation. It was not a prospect to appeal to the superficial eye. But the man from Wisconsin has a creative imagination. He saw at a glance the possibilities. He bought the thousand acres at a price which amounted to exchanging one acre of his Wisconsin fruit farm for thirty acres of the Virginia estate.

Today, after five years of hard work and the investment of considerable money, the old place has been transformed. It supports four hundred head of live stock; there are several hundred acres in timothy, cow peas and corn; the gullies have been filled and seeded over; vistas have been cut here and there through the surrounding trees to bring into view distant bits of water and blue mountains against the sky. The selling value of the place has been more than doubled. Most satisfactory of all, he has a right to feel that he has created new and actual values; that, without injuring any other man, he has made a real addition to the resources of the country.

In another part of the county, in the wide valley which stretches between the Ragged Mountains and the Blue Ridge, is located another man who until five years ago was a mining engineer in the Black Hills. Without experience in farming or fruit growing he came to Albemarle six years ago and, after visiting various parts of the county, bought an old farm on which were more than twelve hundred apple trees of bearing age. The orchard had been neglected for years and the question of a crop of apples was largely left to be answered at the caprice of the San Jose scale and the tent caterpillar. The house—a comfortable frame building—stood under some big oaks on the top of a high knoll at the center of the one hundred-acre tract. When the man from the Black Hills was persuaded to pay five thou-



A BIT OF VIRGINIA'S UPLAND COUNTRY.

sand dollars for this run-down fruit farm he was looked upon as an easy incompetent by many of the wise inhabitants. But he set to work, guided by the best advice he could get from the Experimental stations and the Department of Agriculture at Washington. He pruned his trees, sprayed them several times, cultivated the ground between the trees and sowed cow peas as a cover crop. During his first three years' occupancy of the farm he sold enough apples to pay for the farm, to say nothing of the other products. He has within the past year refused an offer of fifteen thousand dollars for the property.

A Farm Cottage in the Woods.

Such opportunities still exist in the Piedmont district, but they are becoming constantly scarcer and it takes, today, a careful and intelligent search to find one.

There are, of course, disadvantages to be carefully considered. The heat of the summers, while no more intense than the Western farmer is accustomed to, lasts longer and is less frequently broken by cool spells. The negro labor, while fairly abundant and cheap, is sometimes hard for a new man to handle. Much of the land has been robbed and neglected and needs careful nursing and the expenditure of time and money to restore its fertility. And always it is more or less difficult for a man to accustom himself to new conditions of work and living.

Against these drawbacks must be balanced the cheapness of the farm lands; their nearness to the great Eastern markets; the avoidance of all the hardships of pioneer life; the fact that good schools and churches are scattered everywhere about the country and that, in almost every section, the new comer finds himself surrounded by pleasant neighbors.

Meanwhile an increasing army of enterprising men from the North and West are invading the Southland to study conditions and form their own judgment. And in great numbers they are settling down to share in the prosperity to which the argicultural South is entitled and is fast coming to enjoy.

HOSPITAL SHIP FOR OUR FISHERS

A MEASURE introduced into Congress by Representative A. P. Gardner of Massachusetts, is intended to provide a hospital ship for American deep sea fishermen. This is practically an extension of the United States Marine Hospital Service. The vessel proposed will be of the Gloucester fishing schooner type, with sails and an auxiliary gas engine. It will cost about $30,000 and the expense of maintenance will be about $15,000 a year. It will cruise during the winter and spring between the Georges Banks and Banquereau, a distance of 620 miles. In the summer and autumn it will cover the route from Banquereau to the Virgin Rocks, about 350 miles. It is estimated that it should speak about fifty fishing schooners a day. It will adhere to its fixed route, so that the fishermen may know just where to find it at any time.

It is estimated that there are about 6,000 American fishermen sailing out of Massachusetts ports, of which Gloucester is the chief, for the banks off Newfoundland. Many are lost each year by drowning, or their dories are swallowed up in the fog and never heard of again. A great many more suffer injuries that, because prompt medical attendance is not available, usually result fatally even after the patient is landed at the nearest Marine Hospital, which is at Chelsea, near Boston, Mass. A broken leg means amputation, or gangrene; a case of pneumonia is usually fatal; all through lack of prompt care. It is urged that such a hospital ship would save the lives of several hundred American fishermen each year.

The only hospital ship in these waters is a French vessel, the *St. Francois d'Assise*, which covers a radius of some 150 miles from St. Pierre, the only French possession in the North Atlantic. She does not go west of Banquereau, usually, and does not cover Sable Island, La Have and Georges Banks, which are the great fishing grounds for the American fleet. The French boat gives free medical and surgical aid to about three hundred fishermen every year, from May to September.

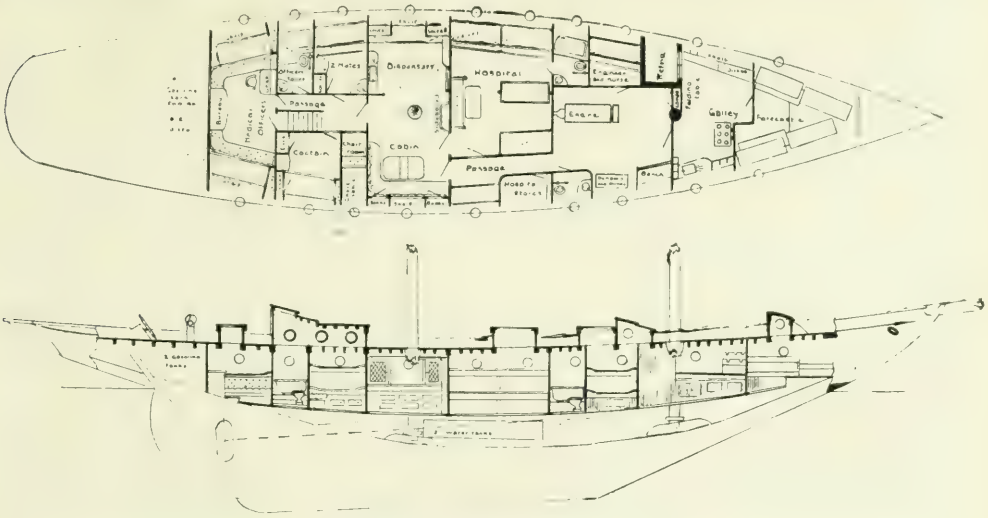
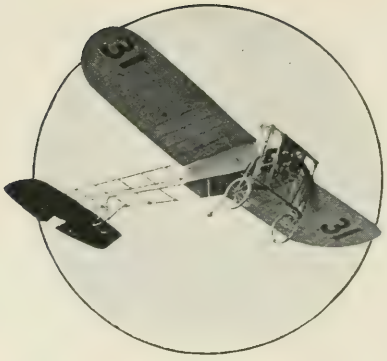


DIAGRAM OF PROPOSED STYLE OF HOSPITAL SHIP FOR OUR DEEP SEA FISHERS.

Uncle Sam, certainly, should not be behind in giving every attention to deep sea fishers that are accorded them by foreign nations. The life of the fisherman is, at best, full of peril. He is most distinctly an important economic asset of the nation, looking at his case from the least humane and most selfish standpoint. As a citizen, he is entitled to this right of medical aid, as much as is any landsman, who has access to the big public hospitals maintained in our large cities.

HOW DEATH LURES THE BIRD MEN



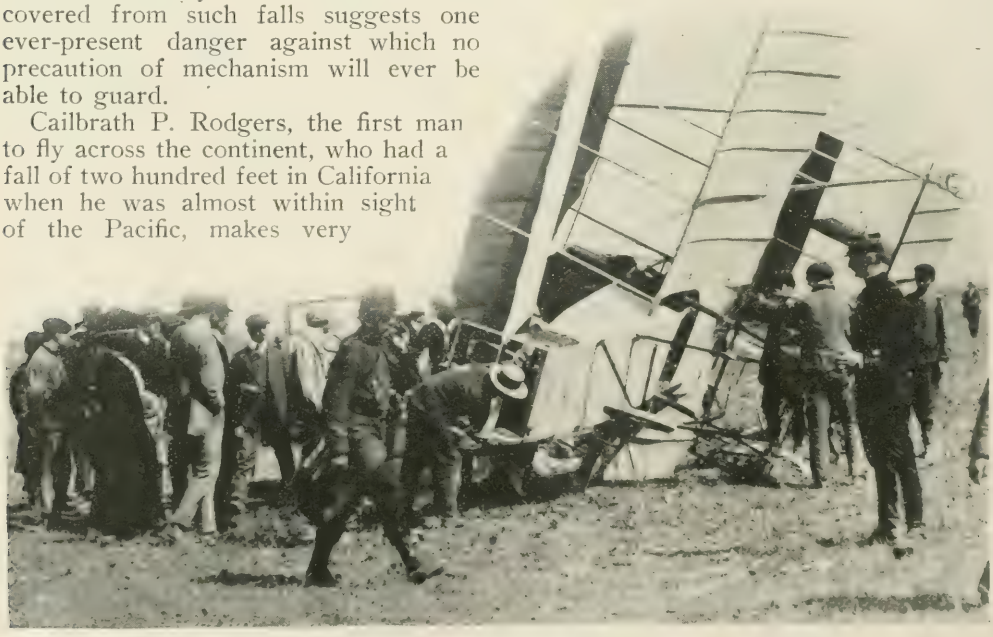
By WENDELL PHILLIPS DODGE

THE bird men of the upper air face a danger hitherto unrecognized. Since Wilbur and Orville Wright made the sand dunes of Kittyhawk immortal, one hundred and sixty aviators have been killed by falls from the sky. More than one-third of these accidents have occurred during the current year. Instead of getting safer with the progress of the art, flying seems to grow more dangerous.

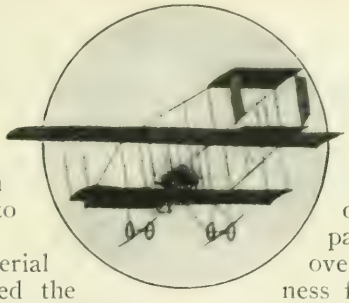
In many cases, it has been impossible to determine the cause of the accident but the testimony of men who have recovered from such falls suggests one ever-present danger against which no precaution of mechanism will ever be able to guard.

Cailbrath P. Rodgers, the first man to fly across the continent, who had a fall of two hundred feet in California when he was almost within sight of the Pacific, makes very clear the real character of this hitherto unrecognized menace.

"When about two hundred feet from the ground, I went to sleep," he says, "and my mind was a blank for thirty hours. It was not the rarified atmosphere which affected me, it was a dreamy sleepiness against which aviators have constantly to fight. There is no choking sensation, no pain in the ears. The air has a peculiar odor, like chloroform or ether. I was at an altitude of one thousand feet when I felt this benumbing sensation creeping over me. I



The Aviator Looks Down



On a Distorted World

realized my peril though unable to do anything to save myself.

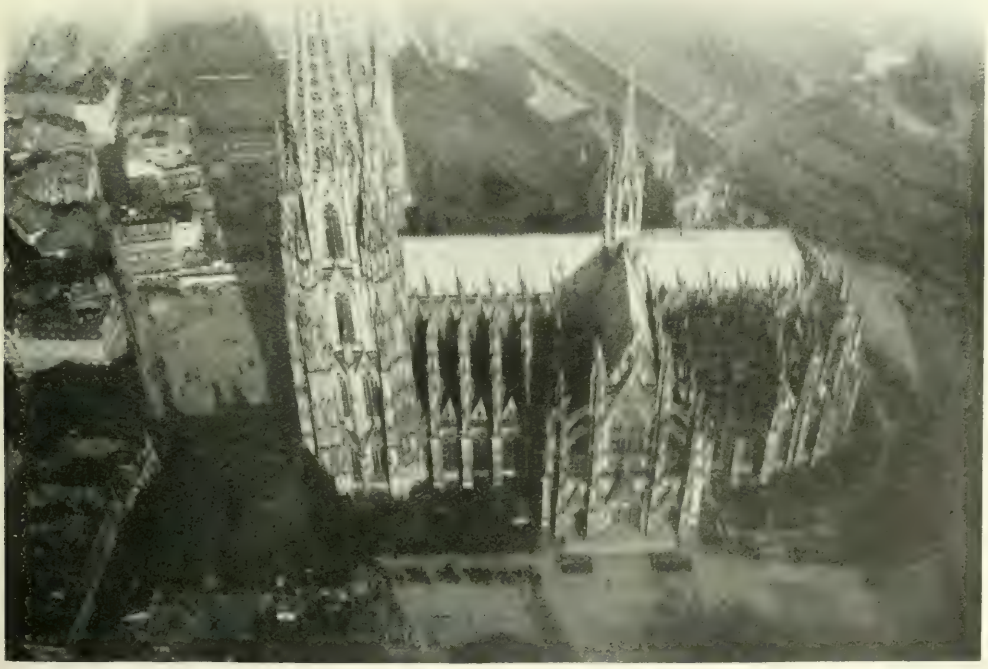
"I believe this same aerial somnipathy to have caused the deaths of 'Arch' Hoxsey, Ralph Johnstone, Eugene Ely and a number of others who have lost control of their aeroplanes and crashed to the ground."

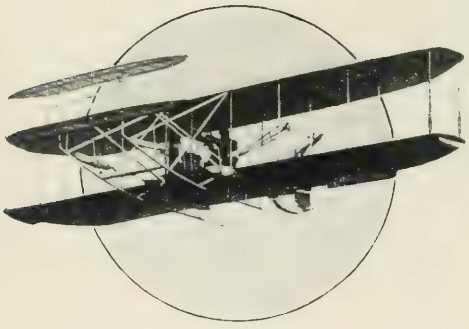
As early as October, 1910, Capt. Madiot fell three hundred feet to his death at Douai, France. Spectators who saw the accident say that they saw him take his hands from the levers of the machine, throw away the helmet he was wearing—as if to gain more air—and then apparently collapse. When the wreck of the machine was examined on the ground, it was found, that the control wires were still in perfect working order.

Monsieur Georges Chavez, the Peruvian air man, who had just completed the passage over the Alps, was within thirty feet of the ground when the wind caught his Bleriot machine and dashed it to the earth. Apparently, he also was already overcome by the fatal drowsiness for he seems to have made no effort to right his plane.

Dr. Cruchet, the French authority, in writing of Aerial Drowsiness, says that it is so great that the eyes close from time to time in spite of the strongest efforts of the aviator to keep them open. In one case, he reports, a searching party was sent out for a young aviator who had failed to return and found him sitting in his machine in the open country sound asleep. When awakened, he was unable to remember how he had made the landing.

Aerial Drowsiness—with its frequently fatal results—seems to be occasioned by the tremendous and half unconscious efforts of the aviator to adjust himself and the organs of his body to constantly and swiftly changing conditions. In the first





"The largest cities seem like toy towns. . . . He is appalled by a sense of utter solitude. . . ."

place, the management of the machine itself requires that every nerve and muscle in the body be kept at high tension during the whole flight. Then the sensations of the aviator soaring thousands of feet above the earth are said to be, in themselves, almost intoxicating.

"To be above the earth! To feel your machine speeding you on! To hold the levers and feel the machine in full flight answering to your slightest move; to look below and see the whole world unfolding itself to your gaze and to know that you are master of the situation—the man who is doing this wonderful thing. When you are rushing through the sky on an aeroplane, you are often almost overcome with this feeling of awe."

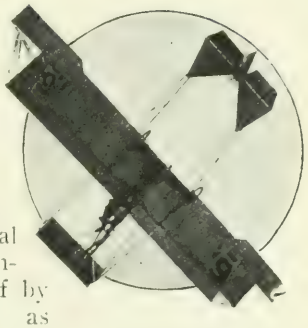
That is the testimony of Claude Grahame-White.

Many aviators soaring in the high air have testified that they become almost intoxicated at the wonderful feeling of infinite space and wrapped in a supreme sense of solitude, have been impelled to drop the levers and let the plane drift downward to destruction. According to the London Lancet, an ascent in an aeroplane brings with it a sense of exhilaration which is, in itself, dangerous.

Lieutenant Conneau, one of the famous experts of the French Navy, who, flying under the name of André Beaumont, has won three of the great international cross-country races this year, said:

"As the air man rises, the earth seems to sink away beneath him. Everything blends together and dwindles away. The largest cities seem like toy towns and

"He soars over the hills and hollowed valleys. . . . His emotions are awe-inspiring — mixed with fear. . . ."



then disappear. Only the sea and great mountains remain. Intoxicated by the sight, the air man mounts and mounts his machine, pointing upward. The distant earth lies flattened out beneath it. Human sounds no longer reach his ear. Suddenly, appalled by an utter sense of solitude, he brings his machine to a level and flies horizontally over the hills and hollowed valleys. All his emotions are profound and awe-inspiring—mixed with very lively sentiment of fear."

This psychical factor varies with the individual, but some of the most expert bird-men have confessed to curious intellectual and emotional affections. Morane spoke of a sort of anguish, caused in part by the feeling of intense solitude. Another man, noted for his *sang-froid* and his virile energy, said that in the downward flight feelings of wretchedness and momentary fear assail one; that the thought of a dreadful death presents itself, and is the more terrible because of the semi-torpor of mind and body. This mental and physical lethargy is spoken of by various aviators as preventing their mechanical acts. There may even be some mental confusion or hallucination. One aviator has, in fact, made the remarkable statement that he constantly had a vision of the spires of the Cathedral of Notre Dame, as if they were close at hand, though he knew them to be hundreds of miles distant.

According to Henry M. Neely, Aviator J. Armstrong Drexel had a most remarkable hallucination during the meet at Lanark, Scotland, a day or two before he made the then world's altitude record. He rose gradually in big circles and was about 2,500 or 3,000 feet up when he suddenly heard above the sound of the engine what he termed an unusual and disagreeable flapping sound at his left

side. Glancing along the front of the "plane" on that side he said he was horrified to see that something was loose and was being torn this way and that by the pressure of the air, through which he was going at the rate of sixty miles an hour. The flapping fabric vibrated too fast for him to see clearly what it was, and he was suddenly overwhelmed with the stupefying realization that the only thing it could be was a piece of the cloth with which the framework was covered and which supplies the supporting surface of an aeroplane. Briefly, it meant that the cloth which alone held him in the air had begun to rip on that side, and he knew that at the tremendous speed at which he was going it would take only one good grip of the wind under such a small opening to tear the entire fabric from front to rear, whip it off the frame and leave him absolutely unsupported on that side, to go crashing below, helpless to avert the disaster. All this flashed across his mind in an instant, but he kept as calm as possible. He was too high for a quick descent, and he came down in as easy curves as he could, in order not to put any extra strain on the torn fabric. All the time he kept his eye glued on that vibrating piece of cloth, fascinated, as he said afterwards, and held spellbound by the problem of whether it would continue to vibrate without tearing until he got down another hundred feet or so to comparative safety, or whether it was merely waiting until the last moment to give a final shrieking rip as though in a fiendish desire to tantalize him with false hope as long as possible. The cold sweat stood out all over his body, and it was only by instinct that he worked the controls of his machine. When he finally touched the ground, and still in his seat, his eyes remained fascinatingly glued to the spot where he had seen the flapping cloth, which had now dropped forward and underneath the "plane," now that the pressure of the wind had ceased. As one of his mechanics came near he shouted to him to go over there and see what was hanging to the "plant." The man walked over, then looked up and said:

"I don't see anything."

"Isn't there a shred of the cloth hanging there?" asked Drexel.

The mechanic ducked under the "plane" and soon came up holding in his hand a little piece of string four or five inches long.

"It wasn't a piece of cloth," he said. "It was just a bit of string that got caught in a bolt."

To give an idea of how deranged the sight, and consequently the mind of an aviator becomes when flying high, this instance of an aviator's wife taking her first trip with her husband in an aeroplane will serve the purpose.

"Wait a moment, George," she said. "I'm afraid we will have to go down again."

"What's wrong?" he asked.

"I believe I have dropped one of the pearl buttons off my jacket. I think I can see it glistening on the ground."

"Keep your seat, my dear," said the aviator. "That's Lake Erie."

Physically, also, there are dangerous factors. To the list of such diseases as sea-sickness, mountain sickness and car-sickness must be added air-sickness. Just as deep-sea divers suffer from the terrible disease known as the "bends," due to the sudden changes in pressure to which their bodies are subjected, so airmen are affected by the even more sudden and constantly repeated changes in the pressure of the air at various altitudes.

But, in spite of all, aviation attracts more and more devotees. The Call of the Clouds grows constantly more compelling. One young aviatrice frankly admits that the lure of the air is more enticing, even, than matrimony! There is no sensation in the world to compare with that which comes when one is flying hundreds of feet in the air, watching the green earth slip away underneath at express speed, according to Miss Blanche Stewart Scott, aviatrice. Miss Scott, who in private life is Mrs. Harry Bronson Tuttle, wife of an automobile man of Dayton, Ohio, hopes to win her aerial pilot's license shortly. But, if she does, it may cost her a husband, for he declares she must choose once and for all between him and aviation.

"Some women may be satisfied," she said, after hearing this ultimatum, "just to have a home, and a husband to support them, and never to know any other

ambition than to wear pretty clothes and go out to luncheons and bridge-parties and other social diversions. For me there is more in life than that, and flying just fills the niche."

Then, there is, also, the lure of gold—there is money in the air! Last year nearly $50,000,000 was paid to men engaged in aviation, over $2,000,000 of which was in prizes won by flyers. Possibly the greatest prize winner of all has been Louis Paulhan, who in less than a year won over $150,000. And, two years ago he was working at wages of fifteen dollars a week! Is it any wonder that aviators risk their lives?

"This is the end of all things."

ONE OF THE WORLD'S LARGEST IRON FLUMES.

MONSTER IRON FLUMES

A LARGE flume has been erected by the United States Reclamation Service, at Belle Fourche, South Dakota. It measures 1,300 feet in length and is ten feet ten inches in diameter.

It is stated that the metal used in it is a very pure iron similar in composition to those irons produced by cumbersome processes, centuries ago, but which have lasted for centuries. It is claimed that this new metal is identical with these except that it is produced by improved methods on a larger scale.

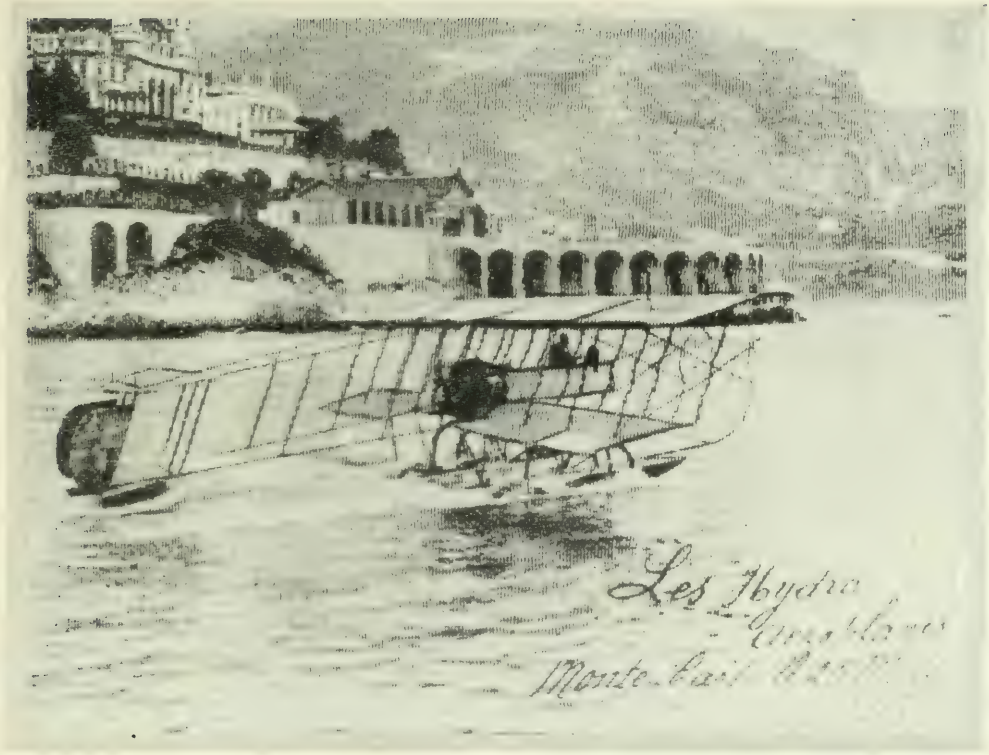
A flume of this type has been installed in Massachusetts, where irrigation is a rarity. These flumes were designed and constructed in sections at Denver.

PICTURES BY WIRE

THE accompanying telephotographs, recently taken by the German scientist, Dr. Korn, are highly interesting. The first shows Lieutenant Boncour, who was recently killed in an aeroplane. The photograph was transmitted from Paris to Monte Carlo and shown in the Casino in the latter place at the same time as the text announcing the accident. The second is that of the race of hydro-aeroplanes at Monaco, and was sent from

PHOTOGRAPH OF LIEUTENANT BONCOUR, TRANSMITTED FROM PARIS TO MONTE CARLO BY WIRE.

Lieutenant Boncour was a little later killed by an aeroplane fall.



THIS PICTURE, OF A HYDRO-AEROPLANE IN THE RACES AT MONACO, WAS TRANSMITTED TO PARIS IN FIFTEEN MINUTES.

Monte Carlo to Paris in fifteen minutes' time.

The originals of these pictures are about 4⅞ by 6¼ inches.

During the past winter and spring there were daily sendings of pictures between Monte Carlo and Paris.

Many of the photos—among them those here reproduced—sent from Monte Carlo in the evening following the events appeared in the Paris papers the next morning.

Dr. Korn was enabled for the first time to send pictures from Berlin to Monte Carlo by wire, using the telegraph line from Berlin to Paris and Paris to Monte Carlo; a total distance of 1490 miles.

Some of the pictures were photographs, some line drawings; meteorological charts were also transmitted by wire and reproduced practically.

The method of reproduction employed has been described in detail in previous issues of this magazine.

AIR-DRIVEN MOTOR SLED

THE picture shows a motor sled on one of the large lakes near Berlin, Germany. It was put to successful use during the abnormal cold days last winter. A twelve-horsepower gasoline motor furnishes the power for the air-propellers which give the sled a velocity of about twenty miles an hour. Its length is sixteen feet and it seats twelve.

MOTOR SLED THAT APPARENTLY HAS A FUTURE.

"He Closed the Famous Restaurants All Through New Orleans."

DOWLING AND DIRT

By

M. A. ROSE

BACK in the dim recesses of Sandy Harry's saloon in Tchoupitoulas street, a man of powerful frame trod silently through the gloom. From the front came the polyglot chatter of sailors at the bar and the shuffle of the decrepit waiter who deposited fried oysters and schooners of beer at tables. The figure in the gloom paid no heed. Ever and anon, the flash of a pocket lamp betrayed his whereabouts. He approached the shadowy bulk of a refrigerator and silently opened the door. His lamp flashed forth; he drew a putty knife from his pocket and scraped noisily at the edge of the food compartment, collecting the scrapings in an envelope. Sandy Harry himself watched with evident anxiety.

"Here's evidence enough to put you out of business," said the sleuth, sternly. Sandy Harry shivered.

* * *

A water front crime? Sherlock Holmes (grown stout) probing a murder enigma?

Not at all. It's Dr. Dowling, on the trail of filth.

Perhaps you've heard of Dr. Dowling, for the flash lamp and putty knife have become a by-word in Louisiana and even beyond the borders their reputation has spread. The pocket lamp has lighted up the musty recesses of almost every restaurant, bakery and creamery in Louisiana and the same putty knife has scraped the edge of hundreds of refrigerator doors, sometimes with grewsome results.

Dr. Dowling is a sanitarian of no mean attainments, but he excels in the application of his science, and the tale of how he cleaned up the state in general and New Orleans in particular is good reading. It forms an epic of the scrub brush.

The Louisiana State Board of Health, Dr. Oscar Dowling president, has a special train which toured the state, exhibiting to the rural communities the cause and effect of tuberculosis; the dangers of the house fly; proper modes of sanitation for country homes, schools and villages; showing how food should be displayed for sale. This train went to the meeting of the American Medical Association in Los Angeles, Cal. It is worth a story by itself.

Every now and then the train would make an unheralded trip, as it did to Oil City, an unincorporated town of 1,200 inhabitants, the fame of whose scum covered pools, heaps of refuse, mountains of tin cans, filthy markets, and unwholesome homes had spread far and wide. The special train rolled into Oil City one Sunday afternoon. The inspectors dropped off and made their rounds. When they were done, each and every householder was arrested and jailed, and a $50 fine was made to "stick." Oil City is "Spotless Town" now.

All this drew more or less attention, usually more, so New Orleans had heard of the doctor, and with amusement and without trepidation—O! utterly without trembling.

It was all right to pester and heckle the little fellows in the jay towns—he had to make a showing, of course—but when it came to annoying "Big Business,"—well that's different. The President of the State Board of Health is appointed by the Governor—a political job you see, and the Governor's friends needn't worry.

So when Dr. Dowling swept down on New Orleans and closed three of its most famous restaurants in a day, there was a grievous shock. One of the places closed was a cafe which served 5,000 lunches a day. The others have long histories and great reputations for the skill of their chefs.

Just to convince everyone that it was a real, sure-enough crusade for that which stands next to Godliness, the lunch room of a million dollar department store was closed next. It wasn't as dirty as Sandy Harry's joint, but it was not clean. That was enough. The most famous coffee house in the city was given twenty-four hours to "clean up." The bankers and business men went elsewhere for their coffee and French pastry for three long weeks before the necessary improvements were made. That's how much good twenty-four hours' notice was.

MORNING VISITORS AT DR. DOWLING'S HEALTH TRAIN—THE MILK LINE.

$100,000 Has Been Appropriated to Screen an Old French Market.

This Load Was Taken Out of a Chinese Restaurant.

Old Slaughter House at Baton Rouge Closed by Dr. Dowling.

The proprietor of one place, closed by court action, grew sarcastic.

"You're such a cleaner," he said to the health officer, "that I believe I'll hire you to show us how it ought to be done. I'll give you a dollar and a half a day to clean up for us."

"I'm busy day times," replied the Doctor, "but I'll be around tonight."

He was. He put on an old pair of shoes, took off his coat, rolled up his sleeves, and went to work. He directed the energies of a gang of negroes, and wielded a broom and scalding water himself. When the job was done, the proprietor was convinced.

"You've earned your money," he said. Dr. Dowling took it, and spent it on a dinner when the restaurant made certain necessary improvements in construction, and was allowed to re-open. The Restauranteur printed a flashlight picture of Dr. Dowling at this dinner as an advertisement.

"Dr. Dowling eats here. Enough said," read the type below the picture.

Dr. Dowling believes in the press as much as he believes in chloride of lime. Printers' ink, properly applied, will disinfect the refrigerator or kitchen of a hotel as thoroughly as carbolic acid, he says, and the results are likely to be more permanent. So the reporters accompanied the Doctor and his inspectors on their rounds. They watched him at his work; saw him pry into dripping corners; wipe greasy walls with a swab which later told strange tales under a microscope; and they wrote it all for their papers.

Indifference, the inertia of moneyed interests, politics—these were obstacles which hampered the work.

In conquering these, the State Board of Health had recourse to a judicial procedure never before employed in the United States. The Sanitary Code of Louisiana was being tested in the Supreme Court at the time, and therefore could not be invoked with good effect. Benjamin T.

Waldo, the Board's attorney, puzzled over the legal aspects of the case for a considerable time, and finally hit upon the civil injunction as the only weapon which could serve him.

After an inspection had revealed unspeakable conditions in a restaurant, he went into court and got civil injunctions restraining the places from operation "in whole or in part" on the grounds that they were "public nuisances" and "menaces to the health of the community." The idea of holding a gay and fashionable dining room up to public scorn as a "menace to the health of the community" made no great hit with the proprietors. They retained attorneys, and prepared for a bitter fight. Somehow the fight never came off. The injunctions stood—they were not even attacked—and instead the places were cleaned up in accordance with orders.

Five Chinese restaurants were closed. Dr. Dowling was in one of these when the aged Chinese who owns the place ostentatiously counted out five yellow "twenties" and put them in an envelope. The envelope he slipped into the Health Officer's pocket. Dr. Dowling handed it back, but the Chinese again slipped it into the Doctor's pocket. The doctor the second time removed it, and this time shoved it into the blouse of the Chinaman.

"No, John," he laughed, "I don't want money."

The Chinese laughed too, and from behind the stove stepped two ward heelers.

New Orleans' market system is unique in the United States. There is the French Market, covering what is equal in area to a city square. The Poydras and Magazine markets also are large, and there are a dozen smaller markets. These are owned by the city, which collects the rental from the stall keepers and applies the surplus over and above maintenance to the city's general needs. The net revenue from the markets yields to the city above $200,000 per year.

In these markets are exposed for sale meat, fish, vegetables and fruits, all in open stalls. Rows of stalls flank the sidewalks, other rows are inside. The dust and dirt, the flies, bugs, everything that the winds whisk through the streets, whirls through the markets and onto the food. Until use breeds the habit, the idea of eating a porterhouse which has been exposed as carelessly as a street urchin's newspaper is startling.

Dr. Dowling now is determined to have the markets screened. The cases are in court. The butchers won't do it, and with good reason. They don't own the stalls. Mayor Behrman says the city cannot afford to, and has shown fight. But Dr. Dowling has won. For screening and sanitation of the markets $100,000 has been appropriated.

What would you think, Mr. Gothamite, or Mr. Chicagoan, if you found your day's supply of bread on the front doorstep when you awoke, perhaps in a basket, more likely leaning against the door?

That has been the custom in New Orleans for so many years that no one remembers when it was otherwise. Such a thing as wrapping a loaf of bread was unheard of.

Dr. Dowling has made them wrap the bread. Another howl! Thirty or forty affidavits now are pending in court against the bakers for violation of this regulation.

Since there are no alleys in New Orleans, the garbage cans must stand on the sidewalks, in front of the houses, until the city wagons come by. Dr. Dowling has ordered that all garbage cans must be of metal, and covered. The first week this order went into effect, it is estimated hardware stores and groceries sold 25,000 garbage cans—so fashionable had the soap box been!

Slaughter houses have come under the keen eye of the sanitarian. Seventeen of them in Calcasieu parish, were put out of business. All were rebuilt. All the slaughter houses in East Baton Rouge parish, wherein is the capital, were closed, and now a $50,000 central concrete structure is being erected by cooperative effort of all the local packers.

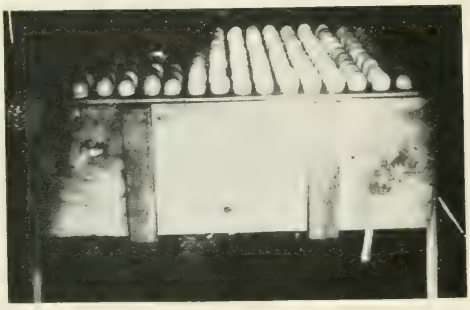
"No use to knock New Orleans," says Dr. Dowling. "New Orleans isn't any dirtier than any other big city, and don't you think it is. The only excuse for giving publicity to what we found and did in the Crescent City is to jog up some of the others a bit. I've been in New York, Chicago and St. Louis, and they've nothing the edge on us, I assure you."

BEATS COLD STORAGE

EGGS can be kept for ten months by the new Hescardé process, and the inventor claims that even after this time they cannot be told from fresh eggs, so that unlike the ordinary cold storage eggs they have a high market value. He makes use of the principle that certain gases can be absorbed by the eggs. These gases have the effect of preserving the contents and preventing any harmful germs from developing which would cause the egg to spoil.

PRESERVING EGGS BY AN ENTIRELY NEW PROCESS IN THE HESCARDE PLANT IN FRANCE.

By properly using the gas process the eggs can thus be kept for a long time. The illustrations show a plant in France where Hescardé is now using his method commercially. When the eggs arrive, they are first examined by placing them end on in a cardboard sheet pierced with holes, using two incandescent lamps underneath, so that the light goes through the eggs and enables the operator to examine the whole board of 160 eggs in a few seconds. The sound eggs are taken to the main room where they are fitted into flat trays of 160 eggs and six of such frames are placed in a sheet iron box. In the rear of the room is the gas-treating tank in the shape of a large air-tight cylinder. The cover is soldered on to each metal box, leaving only a small hole in the top, and the boxes protected by wood framing are stacked upon trucks and are run into the tank upon rails. In the first place all the air is pumped out of the tank and this also removes the air from the air pocket of the eggs and also what gases are dissolved in the white of the egg. When this is finished, the tank is connected to steel bottles holding carbonic acid, and this gas is filled into the tank, being absorbed by the eggs to take the place of the air. A certain amount of nitrogen gas is also supplied from compressed gas bottles, as this is found to aid in the germ-destroying action. A pressure gauge shows when the eggs have absorbed all the gas which they can contain, and then they are ready to be removed from the tank. The operators at once solder up the small hole so that the eggs are no longer affected by the outside air. The boxes now go to cold storage rooms of the usual kind, except that there are no special precautions needed to keep the air dry. In the cold storage quarters the eggs are stored at about the freezing point until they are needed for use. The Hescardé process is beginning to be used both in France and Belgium, and owing to the small extra cost of the apparatus it is likely to be widely adopted.



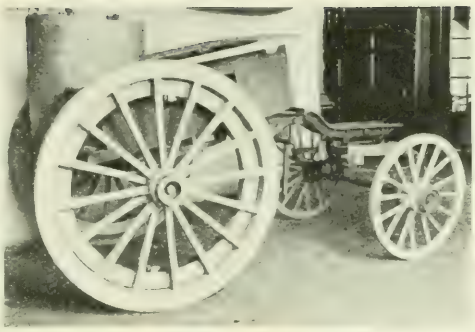
EXAMINING EGGS, BY LAMP IN BOX.

It is a system that Americans might well investigate.

SURPASSING THEMSELVES

THE Belgians are beating their ancestors. The Belgian farmer of today, cultivating the same land his father cultivated a quarter of a century ago, and the same land that had been tilled for a thousand years, is raising about fifty-five per cent more grain to the acre. In the same period the American farmer, cultivating comparatively new land, much of it virgin, has increased his grain yield by but twenty-one per cent. The total average increase per acre in the oats yield in

Belgium is only slightly less than the total average yield in the United States. From 1885 to 1910 the Belgium farmers increased their oat yield from 49.75 bushels per acre to 81.48, or to the extent of 31.37 bushels per acre. In 1910 the average acre yield in the United States was only 31.9 bushels, having increased to that point from 27.6 bushels in 1885. The acre yield of barley in Belgium in 1910 was 19.32 bushels more than in 1885; while the total acre yield in the United States in 1910 was but 22.4 bushels. Belgium's wheat yield in 1910 was 14.01 bushels per acre greater than in 1885; the total American yield of wheat in 1910 was only 13.7 bushels per acre. The yield of Rye in Belgium in 1910 was 12.83 bushels per acre larger than in 1885; and the American total yield in 1910 was only 16.3 bushels.

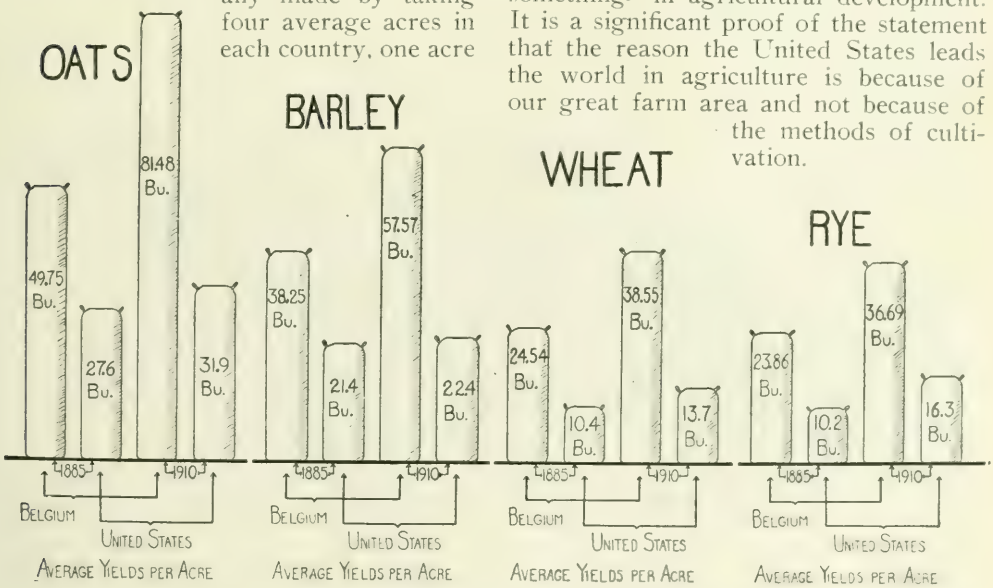


WHAT THE AUTO ONCE WAS LIKE.
The chassis of one of the first types—the "Blue Bell"—of over a generation ago as exhibited at the Motor Museum in London, England.

The comparison may be more graphically made by taking four average acres in each country, one acre each for oats, barley, wheat and rye. The yield of the four acres in Belgium in 1910 was 214.29 bushels of grain, and in 1885 it was 136.4 bushels; the increase in yield in the quarter century was 77.89 bushels for the four acres. The four acres in the United States yielded 69.6 bushels in 1885 and 84.3 in 1910, an increase of 14.7 bushels in the twenty-five years. The total yield of the four acres in the United States in 1910 was only 6.41 bushels more than the increase for the four Belgium acres.

In other words the farmers of Belgium, starting with a yield nearly fifty per cent greater than the American yield, have done almost as much in the last twenty-five years as the American farmers in their entire history.

The accompanying diagram was prepared by the National Soil Fertility League as ocular proof that the time has come for the American farmer "to do something" in agricultural development. It is a significant proof of the statement that the reason the United States leads the world in agriculture is because of our great farm area and not because of the methods of cultivation.



THE AMERICAN FARMER SHOULD WAKE UP. LOOK WHAT THE BELGIANS ARE DOING IN COMPARISON.

A Hot Day in Hyde Park, London.

HOT DAYS IN HYDE PARK

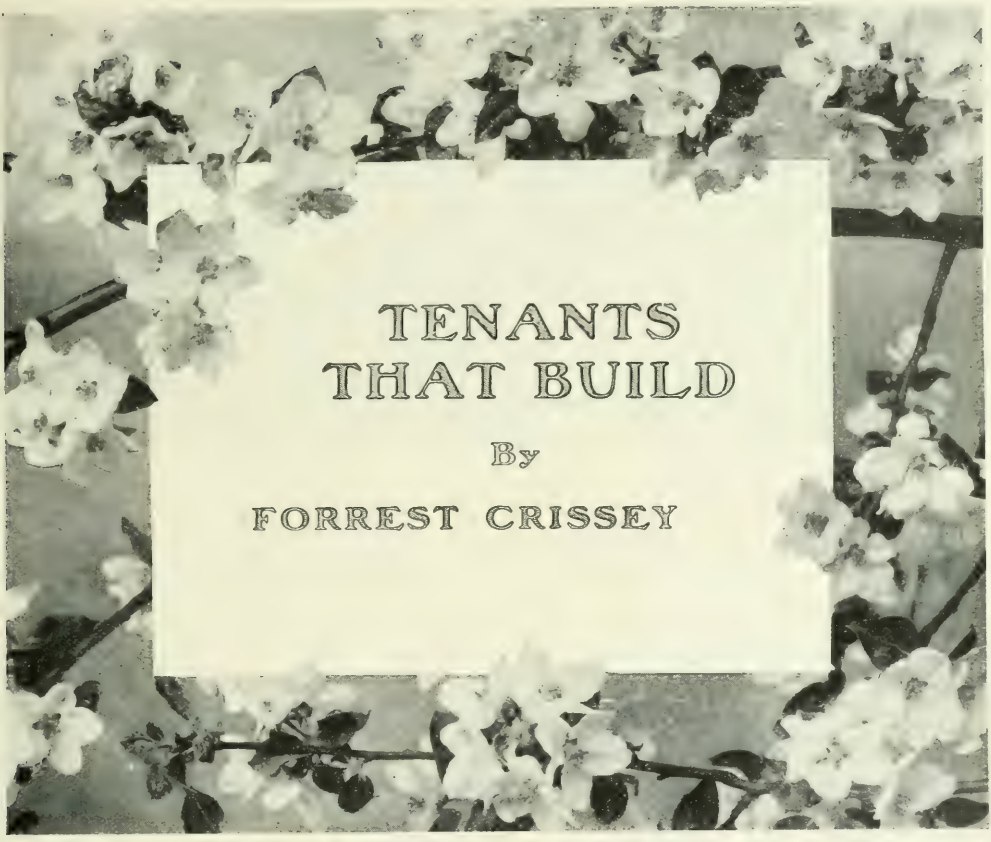
HYDE PARK, London, was the place in which these photographs were taken during a heat wave, and Hyde Park, as is generally known, is one of the fashionable centers of the metropolis of Great Britain. The English, in spite of the world-wide impression that they are a nation of prudes and puritanical hypocrites, do not seem to be greatly shocked by such a sudden and spontaneous return to Nature on the part of these youngsters who found the heat unendurable. The little fellows appear as free and unconcerned as if they were in some swimming pool remote from civilization.

"Bobby" or "Cop" Taking Name of Youngster Who Has Disrobed.

The second illustration, however, shows an officious "bobby" putting a stop to the freedom. The boy shown alone is evidently obeying orders to resume his costume.

ODD SHAPED OAK TREES.

Near Rochester, New York, is a group of oak trees which during the entire winter appear to be cloaked like monks. In fact, they are coated, heavily coated, with ice from the spray which is blown upon them from the Lower Falls of the Genessee River. Each year the trees are mantled with this singular garb which weighs their branches down so heavily that they are unable, during the summer, to entirely recover an upright habit, and thus the general growth of the limbs has become downward, like that of an umbrella tree. These are surely the most unusually shaped of all oak trees.



TENANTS THAT BUILD

By

FORREST CRISSEY

"IF you want to ruin your land, rent it," is accepted as a truism among thrifty farm owners.

Michigan has developed a new and curious kind of tenantry that reverses the ancient order of things and leaves the land enhanced in value and productivity, besides paying fat profits to the tenant. It does this not sometimes, but in practically every instance; the exceptions are so few as to be without weight or importance.

Incidentally this unique tenant system is changing the map of Michigan. Seeing the "miracles" wrought by it, a former head of the State experiment station has become a leader of the new tenant clan and insists that he has now found a line of missionary effort that exerts more practical influence upon the methods of farmers in his State in a single season than he was able to exert in all his years of work as an experimental scientist. Besides, he is paying himself more profits as a tenant than the State paid him as a scientist.

About a year or two after his marriage, young W. S. Pullen found himself facing a hard outlook. The farm from which he and his young wife had hoped to win "good start" in their family life had given them such a meager return that it passed into the hands of the man who held the mortgage. This was all the farming experience that young Pullen cared for just then. He wanted a job, and the first one that came his way was with an Indianapolis factory that needed apple wood for saw handles. It looked to him that here was a job that ought to last until he was gray-headed—for Michigan was full of shaggy old apple orchards, planted years ago by men from New England, and used for hog pastures by their descendants.

As Pullen had expected, it was easy to buy the orchards for about the price of cordwood. But an unexpected diffi-

"MR. PULLEN PUTS THE EMPHASIS OF HIS SUCCESS ON SPRAYING."

culty in the way of his full enjoyment of his job appeared. It hurt him to put the ax—or literally the saw—to a hardy old apple tree that looked in the prime of life. And the oftener he did it the harder it hurt.

"One day," says Mr. Pullen, "over in the Kalamazoo district, I came to a splendid old orchard and found that it was owned by two women. I explained that I was cutting down orchards for saw handle stuff, but remarked that their trees looked too good to be sacrificed that way. But they wanted to sell and were afraid I'd get away without buying. Somehow I couldn't bring myself to cut down such splendid old Northern Spy trees. It seemed wicked. So I finally proposed to them that I would spray the trees and if we succeeded in getting a crop we would share the returns. I knew very little about modern orchard methods then, but I did the best I could. It was an 'off year' for those trees and the crop was a failure.

"But this didn't entirely discourage me. It didn't hurt any less after that to put the saw to a grand old apple tree than it had before. Besides, this feeling drove me to study the question of restoring old orchards to bearing. The more I dug into the problem the more it took hold of me. Finally, when I found a rugged orchard of three hundred trees at Hillsdale I determined to try my hand at the renovation experiment again. I had never heard of orchard renting at that time, but I offered the owner one hundred dollars for two years' rental of his fifty-year-old trees. He took me up before I had time to change my mind. I have since wondered if he was shrewd enough to figure out what might happen.

"I sprayed the orchard myself and waited with a good deal of interest for the results. It brought me $200 that year—just about enough to pay for the spraying materials and give me wages for applying it. But the next season it doubled and the harvest brought me $400. Then the owner said to me:

" 'Young man, you've shown me something. I didn't believe all this talk about spraying trees amounted to anything. I thought the old orchard wasn't worth the ground it took up. Now I know it's the best-paying acreage on the whole place. It's a little hard, after you've brought it back to bearing and shown me what it's worth, to turn you down on renting it again—but that's what I've got to do. Business is business. However, I'll keep quiet and give you a chance to find another man who doesn't know any more than I did when we started in. You're the first tenant I ever heard of who put a piece of farm property into shape that made it worth two or three times what it was when he took hold.'

"This taught me a lesson that was worth all the disappointment of failing to get the orchard again. No more one year or two year contracts for me! Nothing short of a five-year term would

TURNING THE OLD HOG LOT INTO A GOLD MINE.

give me a fair chance to reap the fruits of even my first year's work on an orchard—and if I made any success with it there was a certainty that I could not renew the lease or make another that would give me a fair chance for a reasonable profit."

Feeling sure that he had struck a vein of pay dirt almost unlimited in extent, but being entirely without capital, young Pullen took the proofs of his results to a banker and capitalized his discovery. He then severed his connection with the saw handle factory and applied whole energies to finding orchards for restoration instead of for slaughter. By the following spring he had twenty orchards containing thirty-five hundred trees under lease. These were trimmed as well as sprayed—a task that required a force, throughout the season, of eight to forty men. The best orchard of the twenty contained three hundred sixteen year old trees which yielded seven hundred barrels of No. 1 apples selling for $3.50 a barrel, and seventy-five barrels of seconds which brought $1.50 the barrel. The total income from this grateful orchard in its first season under restoration measures was $2,562.50, or $8.42 a tree. His costs to the tree were:

Rental	$ .50
4 Sprayings	.60
Trimming	.25
Barrels	1.22
	$2.57

A net profit of $5.85 to the tree on an investment of $2.57 is not a bad showing, even in the eyes of a banker! The main trimming cost for the restoration of an old orchard naturally falls upon the first year, while it is reasonable to expect a steady increase in the volume of returns owing to the fact that the effects of spraying, pruning, and fertilization are at their minimum the first season.

Another orchard of one hundred thirty-four trees gave Mr. Pullen three hundred ten barrels of Firsts and twenty-five barrels of Seconds in his beginning season—with only half of the trees in bearing. The next year this orchard yielded five hundred barrels of Firsts.

"There was one old tree of snow apples," remarked Mr. Pullen, "that simply spread herself to let me know what a tree can do by way of expressing gratitude for attention. That tree, 56 years old, has an immense spread, a mighty generous bearing surface. I gathered 53 bushels of apples—47 bushels of Firsts and six of Seconds from that one tree. Early snow apples brought me a fancy price—three dollars and fifty cents a barrel for the Number Ones and fifty cents for the Number Twos. There are several apple trees in Idaho, Washington and Oregon that pay their owners less than $58.12 a season. I take off my hat to that tree every time I pass it!"

Today this pioneer apple-tree tenant has one hundred fifty acres of selected

orchards under five year lease. They will pay him handsomely—but when he turns them back to their owners they will get a producing property in almost the pink of condition in the place of the orchard "wrecks" that he received from them. Mr. Pullen puts the emphasis of his success on his spraying. He uses an approved commercial brand of lime and sulphur, in a solution of one gallon of concentrate to eight gallons of water, for his dormant season spray. For summer spraying the solution is greatly reduced—one gallon of concentrate to thirty-three gallons of water, with the addition of three pounds of arsenate of lead to each one hundred gallons of the solution.

HOW AN APPLE TREE RESPONDS TO GOOD TREATMENT.

In Michigan the rural inhabitants "talk things over" as they do in New England and it was impossible for young Pullen to hide the light of his tree tenantry under a bushel for more than a season. The fame of his achievement spread from one corner grocery to another and one of the earliest men to get the full meaning of its message was Professor T. A. Farrand, for five years in charge of the Michigan State Agricultural Experiment Station.

He studied the problem carefully and found that Michigan had only one acre of orchard in commercial bearing for every 20 acres producing apples twenty-five years before. There were evidently more idle orchards in the State resting on their ancient laurels and growing wood instead of apples than several ambitious tree tenants could take care of. He also knew that Michigan apples have the "old fashioned flavor," the "snap" and the juice of the New England article. There were other considerations, too; but these were enough to compel the conclusion that he could make more money for himself and do better missionary work for the restoration of the former horticultural eminence of his State by becoming a tree tenant than by writing State experiment bulletins that shot over the heads of ninety per cent of the "practical" farmers.

So he started on a gum-shoe canvas for orchard leases—his principal capital consisting of his scientific knowledge of horticultural conditions. This was a greater ally than having a bank at his back. He and his brother bought a power-spraying outfit "on time" and also borrowed the money to finance their first season's operations.

Picking and Sorting the Crop.

Prof. Farrand placed the emphasis of his work on spraying. Here he spared neither labor nor expense. Pruning came next in the scale of thoroughness and cultivation and fertilization were practically neglected. Thinning was a refinement of orchard practice not attempted. His aim was to spray every orchard five times in the course of the season. If he fell short of the full series of sprays in any orchard it was because of some special emergency and not from deliberate intent.

What the Tenant Turns Over to His Landlord.

There was no lack of obstacles and discouragements in the first season of his venture as an orchard renter. Weather conditions were phenomenally severe over the whole State. There were anxious days and nights when it seemed that his whole crop was likely to be wiped out. In one section where he was operating, two out of three orchards, heavy with fruit, were riddled by severe hail and wind storms. But the care that he had given his trees had put them into a state of vigor that enabled them to resist the assaults upon their vitality that took a heavy toll from trees not so well fortified. While the severity of the season forced this aggressive orchard tenant to extra and heavy expense, it cut down the crop throughout the State and gave him excellent prices for the crop returned by the trees that, owing to thorough methods, had that saving margin of vitality that enabled them to bear generously where others failed in part or in whole. On his first season's operations, as a whole, Prof. Farrand cleared a profit equal to thirty per cent on his investment.

A Small Apple "Renter"

From a thoughtful survey of his entire experience as an orchard renter, he makes these important observations:

"We have orchards from 18 to 60 years of age and all of them have paid out. We have never made the enormous profits some are said to have made, but we have demonstrated to our own satis-

faction that we can go to other localities with all the high expense of traveling, hotels, railroads and higher cost of labor —with sometimes no conveniences for doing the work—take a run-down orchard, pay the owner more per year than he has been realizing out of it, and make a profit of from ten to five hundred per cent on the money invested. This is what other words, we conduct a continuous demonstration school in the owner's orchard and pay him for the privilege. In practically all cases we pay him more than he has been able to get from his orchard in years past. All our profit must be over and above that. Then the owner is not only trained in the art of making his trees produce a handsome

"ONE OLD TREE OF SNOW APPLES FAIRLY SPREAD HERSELF."

we have done and we do not claim unusual abilities.

"I believe that we must credit fully ninety-five per cent of our results in producing the fruit to our thorough system of spraying. The remaining five per cent of the credit belongs to the pruning.

"But the final result of all this progressive and upbuilding work is deposited at the door of the orchard owner. If we made five hundred per cent on our investment in every case the owner would still be the chief beneficiary and ought not to begrudge his constructive tenant a cent of his profits. We leave the orchards in splendid condition at the end of our lease, with all of the operations of spraying, picking, packing, pruning and marketing the fruit carried on right under the owner's eyes so that he may see them and go and do likewise. In profit, but his orchard has been made a proven property. He can, if he likes, sell it on the basis of its actual performance. That means that its market value has been immensely increased by the tenant process. In some cases it has been not only added to, but multiplied."

That orchard renting may be practiced with rich results to both owner and tenant in localities that do not enjoy a wide reputation as orchard districts is demonstrated by the experience of two young men in Southern Illinois. Locally they are known as "the Lamar boys."

After scouting about their locality they decided that a certain 35-acre orchard Mocanda offered the conditions for a fair test. The trees were about sixteen years old and were in a state of vigorous neglect. But at the same time they were sturdy—as indicated by the rank growth of the wood. The owner confessed that

he had yet to take a dollar of profit from the orchard and when he closed a lease with "the Lamar boys" covering a period of eight years he evidently felt that he had tasted "easy money." For the whole thirty-five acres they agreed to pay him $250 for the first three years, $300 for the second three years and $350 for the remaining two years.

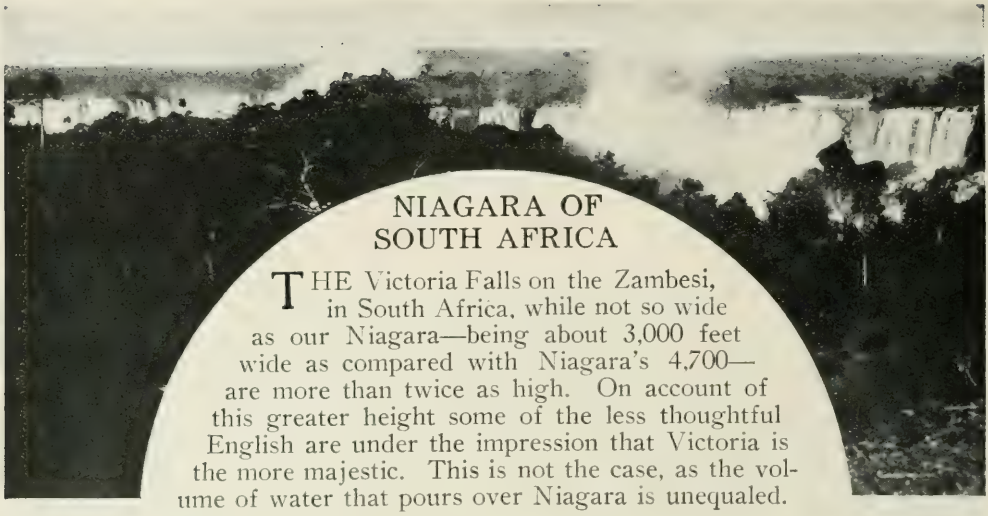
They took possession in March 1911 and began a campaign of pruning that would have brought a protest from the owner had he regarded the trees of any permanent value. But he did not and so he was able to witness the "butchery" without an objection. "We took more apple wood out of that orchard than we left in it" is the way in which Dewit Lamar describes the unsparing thoroughness of their pruning. Nothing was done by way of fertilization and cultivation was also slighted. But the emphasis was placed on spraying. No labor or expense was spared on this score and every tree in the orchard was given the standard lime-and-sulphur spray five times.

For the early fall apples produced by that 35-acre orchard they received in net cash $1,200. This first installment of returns was rather staggering, for most of the orchard was in winter apples —Winesaps—and they had "not counted on the early apples for much of anything." Of the Winesaps they later sold 1,750 barrels at an average price of $4.25 —a total of $7,437.50 for the first crop of winter apples. The whole orchard brought them $8,637.50.

They estimate their total cost of producing and marketing that crop at $1,000, which would leave them a net profit of $7,637.50 for the first year. In other words, the first crop has paid the total rental of the orchard for eight years and left them a net balance of exactly $5,287.50.

Naturally they have lost no time in securing leases on other neglected orchards in that general locality and their acreage next year will be large, for there is no lack of big orchards in their general locality.

Because there are other States besides Illinois where orchards of commercial size have passed into neglect and the sentiment that "you can't raise apples in this State" has become general, this experience of "the Lamar boys" at Mocanda has a broad significance. The man who is minded to rent orchards and apply the same thorough methods that made the Mocanda orchard pay so remarkably need not be hindered from his undertaking because the farmers hold to the opinion that the State in question is "no apple State." If the trees are there in sufficient numbers and show a sturdy growth of wood the prospective orchard tenant is generally warranted in disregarding the farmers' opinion on this point. And he will do well to remember that the lower his State and locality stands in apple production the better will be his local market. This consideration is often a most important one to the orchard tenant.



NIAGARA OF SOUTH AFRICA

THE Victoria Falls on the Zambesi, in South Africa, while not so wide as our Niagara—being about 3,000 feet wide as compared with Niagara's 4,700—are more than twice as high. On account of this greater height some of the less thoughtful English are under the impression that Victoria is the more majestic. This is not the case, as the volume of water that pours over Niagara is unequaled.

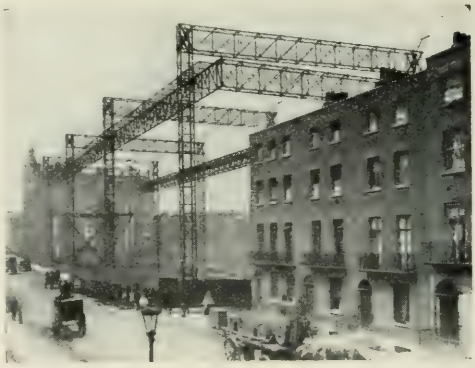
PUBLIC HIGHWAY BUILT IN A DAY

THERE was recently constructed in southern Idaho, a remarkable piece of civic improvement, that is worthy of no little mention. A public highway extending for a distance of thirty miles, from Hansen to Buhl, in Twin Falls County, was built in one day of ten working hours. Men in all walks of life, including several candidates for state offices, volunteered their services, and the work was apportioned in a systematic manner.

The road was constructed so as to afford good water drainage, and one side of it was reserved for automobiles, and the other for common travel. The undertaking was championed by the Automobile Association, as the highway affords a fine thirty-mile spin for autoists.

In the thirty miles the road crosses the Oregon Short Line Railway ten times, and contains 218 bridges of various sizes, so that taken all in all it is quite unique.

PUBLIC HIGHWAY. THIRTY MILES LONG. BUILT IN A DAY.

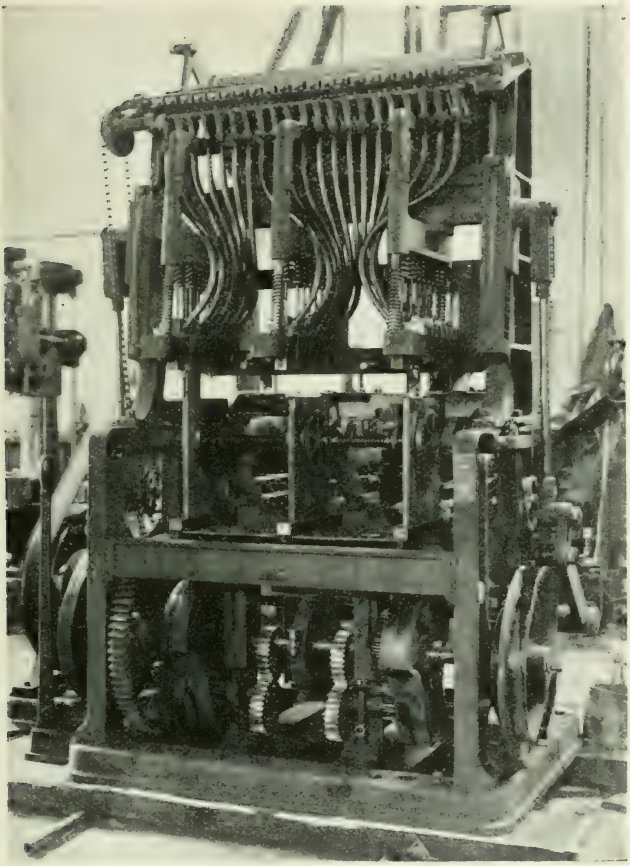


AN EXPERIMENT THAT IS BEING MADE IN LONDON, ON ONE OF THE NEW PUBLIC BUILDINGS.

The use of the tall steel structure, known as a gantry, has hitherto been confined to the building of ships. It is expected that its new use will bring about an increased speed in the construction work, at a less cost.

FIVE HUNDRED BOXES AN HOUR

FIVE hundred complete packing boxes an hour is the record of the new box-nailing machine shown in the illustration. All that is required of the operator is to place the boards, sawn to the proper length for sides and bottoms, in a carrier and those for the ends in two hoppers and the



The Box-Nailing Machine Which Makes Five Hundred Packing Boxes an Hour.

machine attends to the rest of the details.

The action in making the box is almost automatic. One side and two ends are brought forward and held in position by clamps while the machine drives the entire row of nails at each end of the box simultaneously. The box is then turned and the bottom brought forward in exact time to be fitted to its place and nailed in much the same manner as were the sides. The remaining side is then nailed and the box kicked out of the machine by the two ends coming into position to form the next box.

All nails are driven on a slant, or in other words, at an angle with the grain of the wood so that they will hold more tenaciously, and the boxes are square in spite of any unevenness in the sawing of the boards entering into their construction

SOLVING THE BULL PROBLEM

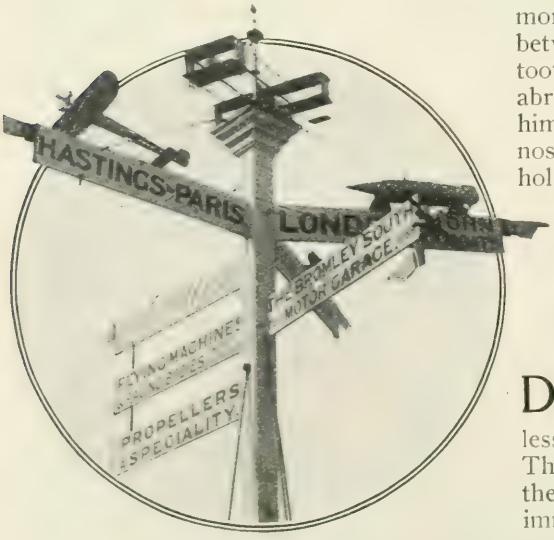
THE bull on the farms of Maine is considered one of the greatest problems that the farmer has to contend with. The question is, what can he be used for that will make him worth his keeping? P. A. Moody of Cornville, Maine, has solved this problem to his satisfaction and to the interest of his community.

Mr. Moody owns a large farm in his town and it is carried on by himself and son. He has a good herd of cattle and among them is a three-year-old Jersey-Guernsey bull. He has also a five-year-old horse, and this horse and bull have become great assets to the farm. Recently the writer had occasion to go to Mr. Moody's. There he saw Moody's son riding a hay tedder with the bull and horse hitched to it. This team was doing work creditable to any double-horse team and without any question was doing it as well as any team could. The young man, who has charge of the team has made a harness especially for the bull. He puts a

A Proof That A Bull Is of Some Value on a Farm as a Draft Animal

AERIAL AUTO TRUCK RECENTLY INTRODUCED INTO THE PARIS FIRE DEPARTMENT.
It consists of a series of ladders, which may be extended, and is supported by a strong folding framework of steel. It can be run up alongside of a building and used as a fire escape. It is operated by power furnished by the auto.

collar and hames on him and places instead of a bridle the end of the rein into the ring in the bull's nose. The bull is hitched on the off side, and the guiding rein that comes between the horse and the bull is hitched into the other side of the ring. The horse is hitched into the regular harness in the usual way. This bull is not only used on the tedder beside the horse, but in plowing Mr. Moody hitches the animal on ahead of a pair of horses. He claims that he is as strong as either of his horses and can stand more work. He has even hitched him between a pair of horses to haul a spring-tooth harrow, having the team three abreast. The men take no chances with him. They use the staff in the bull's nose until he is harnessed and the son has hold of the reins. The animal shows a docile disposition and apparently enjoys the work.



AN UP-TO-DATE SIGN POST.
On the main London road to Hastings road, a sign-post for airmen, motorists and cyclists has been erected. An arm directing the way to Hastings and Paris for airmen is mounted with an aeroplane; one directing the way to London and John-O-Grants, is mounted with a racing motor car, and another directing the way to Brooklands, is mounted with a motorcycle. This is the first and only sign-post of its kind in England, and probably in the world.

SHADOWLESS DRAFTING TABLE

DESIGNED at Wausau, Wisconsin, this drafting table, which is shadowless, is illuminated by electric lamps. These lamps may be so adjusted back of the glass that their warmth dries the ink immediately and it is possible to work at once over traced lines without soiling the drawing.

The construction of this table is such that it may be quickly and easily placed at any angle or height, and is always in perfect balance and rigid and firm. It

has a plate-glass top with a cork-pine frame to which may be instantly attached — with ordinary thumb-tacks, shot bags or a special suction device — any class of work of various sizes. The surface is naturally as smooth as only plate glass can be. Tracings from blueprints or any kind of drawings — even from plans backed with linen — can be made with perfect accuracy, on any kind or thickness of paper and with a great saving in time.

At Work at the Shadowless Drafting Table.

Another advantage claimed for the table is that it is restful and easy on the eyes. The light coming from beneath is so subdued and soft that it never becomes tiresome, and it dispels all cast shadows and does away with the necessity for glaring lights immediately in front from windows, or overhead from artificial lights.

The light beneath may be intensified to any desired degree for transfusion through heavy copy, and may be subdued at will by the addition of tissue sheets or by reducing the electric lamp power.

The question of light is just as important to the lowest-salaried tracing man in the office as it is to the most expensive man, while the man in the farthest and darkest corner in the office has a better light with the "shadowless" table than the man next to the best window in the office can possibly have without this device.

As to the rapidity with which work may be done with this device, it is said that it is a great saver of time to the overworked draftsman, as there is no necessity for moving about hunting for the correct light.

A "BRILLIANT" EVENT.

At a horse show held in Springfield, Ohio, recently, it was found necessary to extend the events into the evening. As the show took place in front of the grand stand on the fair grounds the problem of efficiently lighting the space was not a simple one. The local electric lighting company finally solved it as is well shown in the accompanying photograph. They extended their line something over one-half mile to the track where seven hundred 16-candle power incandescent lamps were suspended in long rows across the race-track.

UNIT TYPE OF COTTAGE SCHOOLS AT COLORADO SPRINGS, COL.

COTTAGE TYPE OF PUBLIC SCHOOLS

By

ARTHUR CHAPMAN

THE cottage, or unit, type of public school is being tried in Pueblo and Colorado Springs, Colorado. So successful has the experiment proved in both cities that a revolution in school building seems likely to result in all but the crowded districts of the extremely large cities, where real estate conditions seem to make the single building of many rooms a necessity.

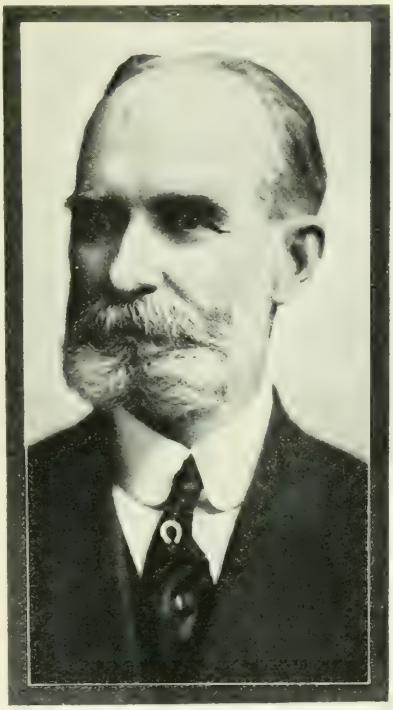
The unit plan was first worked out in Pueblo, in frail, makeshift cottages and proved successful from the start. Colorado Springs recently completed the construction of a model group of school buildings of this type, and the school authorities of that city are so certain that they are on the right course that they are building an even more radical collection of unit schools, which will combine the open-air feature with their many other advantages, each school having a large porch, where classes will receive instruction in pleasant weather.

The Buena Vista school at Colorado Springs occupies an entire block. Instead of being housed in one large building, the grades are divided among several one-story cottages. The main building is in the center of the line of cottages. This building contains the principal's office and an auditorium with a stage at the rear. The primary divisions are housed in the wings of the main building. Movable desks and chairs are used, and the rooms are divided by sliding partitions. These can be raised, thus converting the whole building into an auditorium which will comfortably seat 500 persons. Entertainments can be given on the stage and dancing and gymnastics can be made a feature, owing to the readiness with which the main floor can be cleared. The main building can be used for neighborhood meetings, and parents as well as children have the privilege of the shower baths in the basement.

Flanking the main building are the cottages which are used for housing the various grades. There is ample accommodation for fifty pupils in each cottage. The conditions for study and teaching are ideal. The detaching of each cottage makes for absolute quiet. There are no distractions owing to the moving of classes in other rooms. Recitations can be held or classes dismissed without in the least disturbing other rooms. Each cottage has a sanitary drinking fountain in the front hall. There is a rest room, furnished with a couch. This gives a privacy that is not possible in a large building, with one general retiring room.

Light is admitted from all sides of the unit building, and there are no dark corners or hallways. Ventilation problems are simplified, and the work of cleaning and fumigating is much easier. There is a general playground at the back of the schools, but the pupils generally prefer to play in the space in front of each cottage. This keeps the classes together at recess and simplifies playground problems. As the main building at Colorado Springs is several feet nearer the sidewalk than the other buildings, the principal is enabled to keep watch of the playgrounds on both sides.

The chief recommendation for the unit type of school, however, is the total elimination of the fire danger. Since the Collinwood disaster at Cleveland, the attention of school authorities has been bent on developing a type of school which will minimize the danger of loss of life through fire. The unit type seems ideal in this respect. The buildings at Colorado Springs are heated from a separate heating plant at the rear of the group. In case of an alarm in a cottage, the building could be emptied in a few seconds. There would be no stairs for the children to fall down. All the torturing problems of rickety fire escapes and locked doors would be eliminated, and parents sending their children to a cottage school would have their chief source of fear removed.



DR. R. C. CORWIN.
Father of the Unit Type Public School.

In the opinion of Dr. R. C. Corwin of Minnequa Hospital, Pueblo, who has been a sturdy champion of the unit type of school for many years, and who has been largely responsible for the establishment of the schools in Colorado, the elimination of fire drills is a great thing in itself. In the cottage schools no such drills are necessary. Classes are not interrupted, and there is no nervous strain on children who are easily startled. Dr. Corwin has long preached against the folly of making little children climb long flights of stairs. The cottage type of school does away with this source of ill health. In Minnequa Hospital Dr. Corwin has done away with stairs altogether, substituting inclines.

There is less liability of contagion in the unit type of school. At Pueblo it has been noticed that the cottages remain entirely free from contagion of any sort, while many of the children from other schools are having measles, mumps and chicken-pox. In case of infection, it can be confined to one cottage. There is no sweeping of refuse from halls and stairs—a notable source of contagion in schools of the older type.

One of the many practical advantages of the unit school is the fact that it can be built to suit the needs of a neighborhood. The old school building is either ahead or behind such demands. The school board usually waits as long as it can before building, and then it puts up a school large enough to take care of the neighborhood growth for ten years. The unit school is like the generally adopted unit bookcase—its growth can be made so gradual that it will not prove to be a tax on the purse. If conditions change in a neighborhood, and it is desirable to move one of the cottages to a part of the city that is growing faster, the removal of the building can be accomplished with little trouble. The lighter foundations, walls and supports, the absence of dead central spaces, etc., make this form of school the most economical to construct.

"The six rooms now comprising the Buena Vista school have cost about $35,-

000," said Carlos M. Cole, Superintendent of Colorado Springs schools. "When two more buildings have been put up, thus providing accommodations for the entire eight grades, the average cost will be reduced to about $5,000 a room. This is the average generally figured on in building a school of the old type. So, outside the question of real estate, a school of the unit type costs no more than the old."

The Colorado Springs cottages are built of buff, glazed brick, trimmed with white, polished stone. The lavatories are in the building containing the heating plant, and are of the latest sanitary type. In fact the danger from infection has been reduced to a minimum. The greatest problem of the ten or twelve-room school is that of health. As the number of rooms is increased, the danger of contagion grows in proportion, which is not the case in the unit school.

Teachers who have conducted classes in unit type schools say the plan gives opportunity for greater individuality, both on the part of instructor and pupil. Recesses may be taken without disturbing other rooms. There is a homelike atmosphere in the cottage school which it is not possible to obtain in larger buildings. It is pointed out that this is especially valuable in the case of the small child, who, for the first six years of life, has been reared in the quiet atmosphere of home and who finds it difficult to become accustomed to the contrasting noise of the ordinary school. The view from the ground floor is more attractive to children, also, being closer to nature. When the "porch type" cottages are constructed at Colorado Springs this sense of nearness to nature will be intensified, as the children will be moved outdoors on pleasant days, curtains which are operated from the bottom shutting off too-boisterous breezes.

Dr. Corwin advocates the extension of the unit plans to high schools, with certain modifications. He would have the plant consist of three buildings, none more than two stories in height. One building could be devoted to literary work; in the second building would be the heating plant, janitor's rooms, etc. This building would also contain the manual training and domestic science and chemical departments. The third building would contain the hall and library. Dr. Corwin estimates that such a high school would cost less than a school built on the stereotyped plan. Removing the manual training, domestic science and chemical departments would take many distracting influences away from those engaged in purely literary studies. Above all, the danger from fire and contagion would be greatly reduced. Not only is life much safer in the cottage type of school, but the destruction of property by smoke and water is certain to be much less in case of fire.

In recent years the school has come to the fore as a neighborhood social center. Schools are now used by parents, as well as children, for church services, political gatherings, entertainments, and, in some communities even the weddings and funerals. Here also is conducted the night school—or Workingman's College as it is termed in some communities.

The ordinary school is ill adapted for such purposes. The individual rooms are too small for public gatherings. The children's desks and seats, fastened to the floor, are nothing short of torture to adults. Dancing and gymnastics are precluded. In addition, the use of such rooms for public meetings is so destructive to desks and other school furniture and paraphernalia that school teachers often become hostile to such a form of social center work.

The spacious main building of the unit type of school permits all the things which the architecture of the old school forbids. With the removable desks and chairs of the kindergartners and first-graders out of the way and the sliding partitions raised, the building is converted into a spacious auditorium. The stage at the back of the central room, or auditorium proper, can be put to a variety of uses, even to plays and illustrated lectures. The floor can be cleared for dancing, which is an important feature of social life, especially in mining communities. The gymnasium and baths in the basement can be put to general use, and parents can be made to feel in a dozen ways that they are really interested in the schools to which they send their children. With this interest once aroused, the work of the teacher in se-

curing the best efforts of the child is reduced to a minimum. The indifference of parents to the school is often the cause of disobedience and careless work on the part of children.

The Colorado cities that are experimenting with this unique type of school have secured expressions of opinion from teachers, children and parents, and all favor the unit plan. Everything seems to point to it as the school of the future, even in those large cities which have not been fortunate enough to set aside ample school land early in their career. If private individuals and corporations in those cities can clear valuable land for stores, depots and manufacturing plants, municipalities need not hesitate to clear space for school purposes; nor is it likely they will delay when the advantages of the unit school, even in its modified, three-building type, are fully realized.

Reform has been slower in reaching the public school system than almost any other government activity. Today there is growing up a widespread and intelligent interest in the work. One of the most important discoveries is that the mental progress of the children is almost entirely dependent on their physical condition. And in conserving and improving the health of the pupils the new cottage type of building seems certain to play an important part.

KINDERGARTEN ROOM IN MAIN BUILDING, BUENA VISTA COTTAGE SCHOOL, COLORADO SPRINGS, SHOWING MOVABLE CHAIRS AND TABLES.

EACH COTTAGE SCHOOL HAS A SANITARY DRINKING FOUNTAIN.

SPRINKLING ROAD
THROUGH THE PEACH ORCHARDS.

FINE FLOWER OF CO-OPERATION

By

RENÉ BACHE

YOU ride for more than thirty miles over smooth roads that are watered twice a day in the summer time. You may walk, if you please on mile after mile of concrete sidewalks stretching away through the farming districts. On an autumn night you may be startled to see scores of men at work on either side the roads under the blazing glare of electric lights. And in the winter time, when a sudden cold snap settles down over the valley you may look out to see the glow of thousands of little stoves, stretching away endlessly under the trees—for here they heat "all out doors."

Perhaps nowhere in the world has co-operation borne such perfect fruit as in this Grand Valley in Western Colorado, where the national government is about to spend $5,000,000 in a great irrigation project. You climb the mountains and drive along the edge of high cliffs to look down at the long horse-shoe of the valley hemmed in by steep, high mesas, rising like shelves one above the other. At present only a small percentage of the valley's forty-five miles is under cultivation. More than 60,000 acres are still covered with the original sage-brush and it is to bring water to this great tract that the government is to build a huge concrete dam across the Grand river and send the stream down a high-line canal along one of the mesas to be diverted through laterals to the valley below.

Individual fruit growers, organized into a co-operative association, have already demonstrated the wonderful fertility of the land, under irrigation, and have given what is perhaps the best example in this country of the benefits of co-operation.

The association manages and controls practically everything in the valley. It pays for sprinkling carts, incidentally making for the health and comfort of the community, but primarily for the reason that rising dust prevents Grand Valley

peaches from reaching the richest possible tinge of color.

It was in the Grand Valley that the idea of heating orchards as a precaution against frost was first introduced. There also for the first time was the practice of picking and packing peaches by electric light adopted—incandescent bulbs, strung along wires, being shifted at night from place to place through the orchards, as they are wanted for illumination. It is there, furthermore, that the device of

GRAND VALLEY WHERE THE GOVERNMENT WILL SPEND $5,000,000 FOR THE DEVELOPMENT OF THE FRUIT INDUSTRY.

subterranean storage for apples is now being developed on a large scale—each grower digging a hole in the ground big enough to contain half his crop, covering it with boards, earth, straw, and more earth, and putting his apples into it as they are taken from the trees. The protection against frost is ample, in that mild climate, and the apples keep so well under such conditions that the selling season for them can be greatly prolonged, giving the profitable advantage of a late market to the fortunate grower.

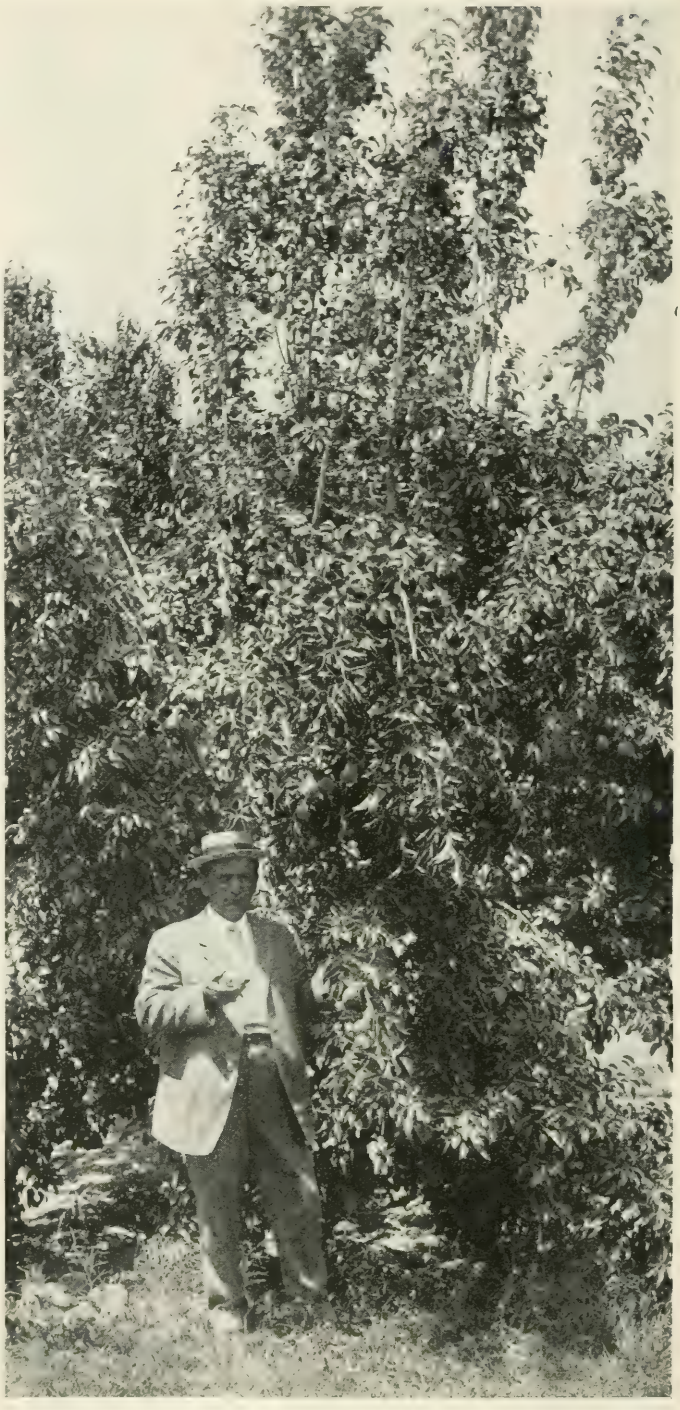
The association is planning cold-storage plants for pears. Fruit of this kind ripens with better flavor off the tree, and accordingly it is picked as soon as it has obtained maximum size, though yet green, and (under the system now adopted) put in a dark, cool place, where it advances slowly to edible perfection. The trouble is well worth taking, when it is considered that in the Grand Valley a single tree will sometimes yield $125 worth of high-priced pears in a season.

Where land is worth so much (sometimes fetching $4,000 an acre when planted with trees in bearing), and such intensive methods of culture are adopted, it does not pay to produce anything but gilt-edged fruit—such fruit as only well-to-do people can afford to buy. Hence the adoption of the plan by which most of the peaches, apples, or what-not are cut off and thrown away before they

have a chance to develop. According to the cultural rule, not more than two "pieces of fruit" are to be allowed to remain on a twig twelve inches long — though it commonly happens that there are from seven to fifteen to start with. To do this sort of pruning is a heartbreaking job — for all the world like scissoring dollars into bits and casting them to the breezes. But, as a knowing resident of Grand Valley once remarked, if the grower feels unable to undertake it for himself with the requisite ruthlessness, the thing for him to do is to hire a man who knows how, and then to go a-fishing.

The sacrificial process in question accomplishes two important objects. It insures the perfect development of the fruits left on the boughs, and it prevents the tree from being overworked. If a tree be overloaded this year, it will produce little next year. Hence the experienced grower tries to make it bear a moderate-sized crop every year.

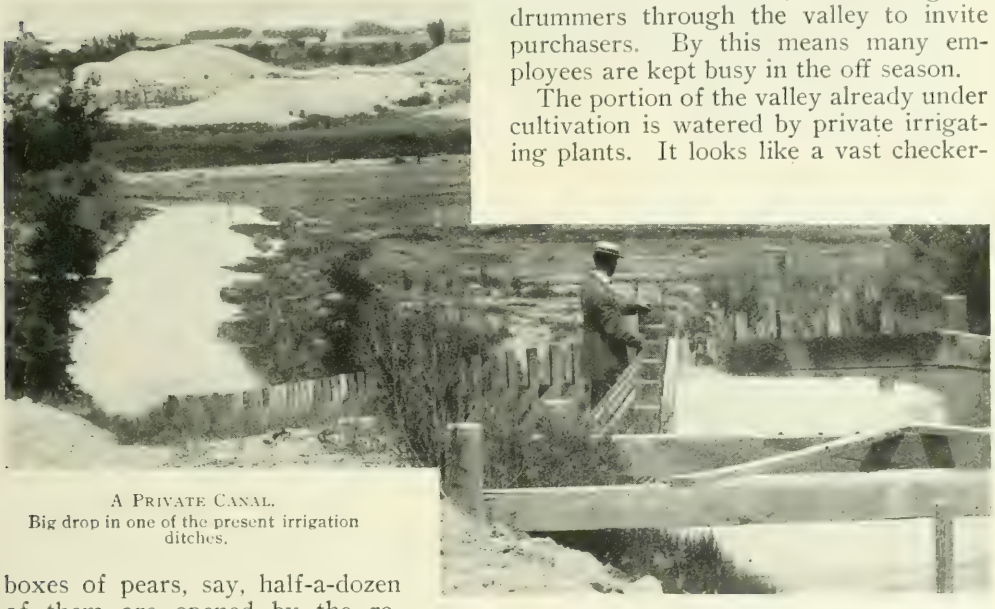
The growers' association buys all the boxing material, packing tools, spraying outfits and chemicals, and a large part of the machinery and hardware required by its members, who get such things in this way at wholesale cost. Each member may use his growing crop as a bank account to draw upon. The manager looks over his orchard, and says that he is entitled to so much credit—advances he receives in this way being eventually deducted from the sum obtained from the sale of his fruit.



Pear Tree That Bore a $120.00 Crop.

The grower has nothing to do but to

produce and pack the fruit; the association attends to everything else. Grading, however, is very strict. All business is understood to be done "on honor," and any attempt on a farmer's part to cheat is liable to bring about his expulsion from the co-operative body. Inspection is extremely rigid. When a grower's output of peaches or what not has been delivered on the railroad platform, it is examined before being shipped. If there are forty boxes of pears, say, half-a-dozen of them are opened by the removal of one or two strips of wood in such fashion as to disclose the contents of the baskets from top to bottom. There must be no such thing as putting fine ones on top and inferior ones beneath; all are required to be alike.



A Private Canal.
Big drop in one of the present irrigation ditches.

If found all right, the boxes are put aboard the cars with other fruit of the same kind and grade. Suppose they are "fancy" Jonathan apples; then they are shipped together with other fancy Jonathans. The grower's association number is stamped on every one of his boxes, which are duly credited to his account. In this way, the merchandise being forwarded in carload lots, he gets the benefit of the carload rate. Expenses of handling, shipping and marketing are charged against him, and five per cent of the net proceeds is withheld to pay for running the association.

It is a cash business throughout, all fruit being delivered to consumers or commission agents C. O. D. Some notion of its size may be had from the fact that in the summer time the association employs forty clerks and stenographers, and ships from $3,0000,000 to $6,000,000 worth of peaches, apples, pears, table grapes, cherries, strawberries, and raspberries every year. Incidentally, the organization does a large jobbing business, buying all sorts of merchandise in carload lots, and sending out drummers through the valley to invite purchasers. By this means many employees are kept busy in the off season.

The portion of the valley already under cultivation is watered by private irrigating plants. It looks like a vast checkerboard, being divided up into small square or rectangular farms, most of which are not more than ten acres in area. This, of course, signifies a relatively dense population. The ice man calls at every farmhouse daily. Telephone lines run everywhere. In the busy season the merchants of the towns send their wagons eight or ten miles into the outlying country, to deliver goods, in order that the farm folks may not find it necessary to leave their work. There are six towns in the valley, the biggest being Grand Junction, with a population of about 10,000.

The people of the valley are nearly all of them native-born Americans. They have come from all parts of the United States, and have deserted every imaginable profession and calling to take up the business of fruit growing.

RAILWAY AUTOMOBILE CAR ALREADY

THE RAILWAY AUTOMOBILE

THE rapid growth of the interurban road together with the success of the automobile has undoubtedly influenced the development of the new form of traction car shown in the illustration. It is the product of an Omaha firm and is proving so efficient that it has been adopted by thirty-seven railroads for their branch lines and interurban traffic.

The car is built entirely of steel and is operated by a 250 horse power gasoline motor. The body resembles the inverted hull of a ship, the wedge shaped front and rounded rear ends, together with the side entrances being the most noticeable differences between this and other cars, while the roof is lower and of a semi-elliptical form.

The wedge shaped front offers less resistance to the air than the usual blunt form, and for this reason a considerable saving is effected in operating expense. In a drifting test recently made, that is, running the car without power, on a six mile grade the car with the wedge-shaped end left the top of the hill at forty miles per hour covering the distance in nine minutes and attaining a speed of fifty miles per hour before reaching the end of the grade. A car with a blunt end started at the top of the hill at the same speed but it was necessary to use power on the last 1⅛ miles and thirteen minutes were consumed in covering the distance.

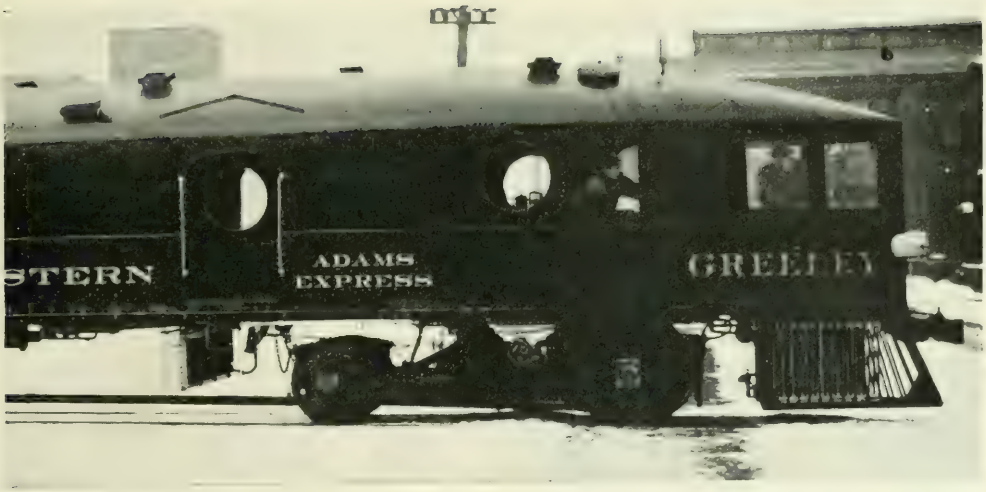
More than one hundred of the new cars are in daily use in this country and thus far have been built in two sizes, fifty-five feet and seventy feet in length, with compartments at the front for the engineer and also for baggage if desired.

PORTABLE STOVES OF THE FILIPINOS

IT is very necessary that the peasant class of Filipinos have portable stoves, and the style of their portables is something unique and strange to the average

HOW THE FILIPINOS WARM THEMSELVES.

American. The peasant class live in nipa, or thatched, huts the material of which is as inflammable as straw or paper, and for this reason it is necessary to have a stove that can be quickly taken out doors on occasions and one that does



ADOPTED BY THIRTY-SEVEN ROADS.

not require a pipe through the ceiling or roof. The fact is that the problem of getting rid of the smoke from the cook stove doesn't much bother the native housewife. She knows her grass house is so full of cracks and holes that the smoke will sooner or later find its way out. Then, too, many Filipino homes of the poorer class are so small that there is no room for cooking stoves, even of the native type, so that it is necessary to do the cooking in the yard or under the hut.

These stoves are of various shapes to suit the whims of the owner. They are usually made of clay, baked hard and hollowed out to hold a few burning sticks. The pots and pans are placed on the fire, and fresh fuel is poked beneath them from time to time until the meal is done.

A FINE NATIONAL LIBRARY

THE parliamentary library at Ottawa, the Canadian capital, has the reputation of being one of the most perfect pieces of public architecture in America.

It is a circular building, constructed after the plan of the library of the British Museum, and has a dome ninety feet high. It is built of sandstone, uniform with the main buildings of the Parliament Hill group, and is a distinct ornament to the capital. Like most of the other parliamentary buildings, however, it is already outgrown.

PICNICS FOR PATRONS

PATRONS of one of the Los Angeles motor car agencies enjoy occasional picnic parties as a courtesy on the part of the management. More than fifty cars usually participate in little runs into the country where games, basket lunches and hot coffee and lemonade are the order of the day. Good will is thus secured and retained.

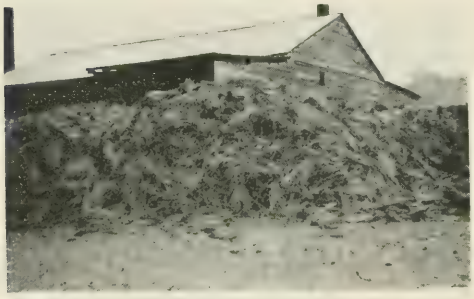
NATIONAL LIBRARY OF CANADA.

MAKING WAX FROM A WEED

THE results of scientific experiments show that the wild candelilla plant of the Southwest is valuable for the manufacture of wax of high grade. While there are at this time several factories devoted to the new industry the demand for the wax is being created slowly both

CANDELILLA PLANT FOR WAX MAKING.

in Europe and the United States. It is claimed, however, by men who are interested in the manufacture of this product that it is destined to come into large use. It is claimed to be specially suited for electrical insulation and the manufacture of phonograph records, wooden and leather polishes, floor wax, varnishes, pharmaceutical articles, candles and rubber compounds. It is of a grade similar to that of the carnauba wax of Brazil but



CANDELILLA CROP GATHERED FOR TREATMENT.

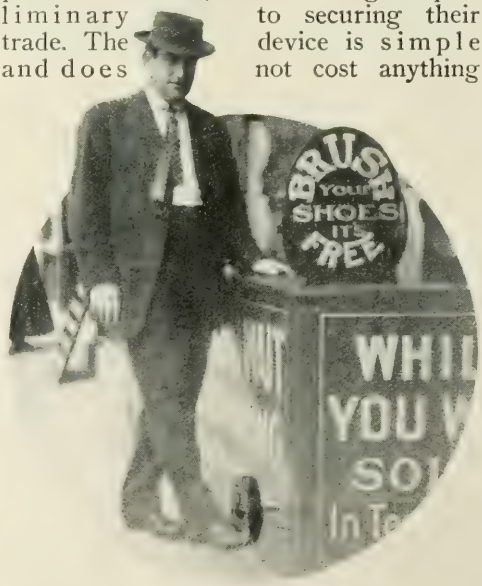
has not yet reached the height of favor that the latter commodity possesses with the trade. Besides the large candelilla growing area in Southwestern Texas and Northern Mexico, there is a broad scope of territory bordering the west coast of Mexico where the plant grows in much profusion.

The plant reproduces itself each year upon being cut off at the roots. It requires about thirty tons of the weed to produce one ton of wax. The production per acre is one to ten tons annually. The cost of cutting, hauling and treating one ton of the raw product is about $2.75. The wax sells for $500 to $700 per ton.

Several different processes for extracting the wax from the weed are in use. Some of these are mechanical and others are chemical. The process generally used is boiling and steaming. The crude wax thus obtained is subsequently refined.

FREE SHINES DRAW TRADE

A LOS ANGELES shoe-dealer and repairer has devised a simple little plan to induce people to stop before his place of business, which is a good preliminary to securing their trade. The device is simple and does not cost anything



FREE REVOLVING SHOE BRUSH.

to operate and but a trifle to install. It consists of a circular brush of soft bristles which is set a few inches above the sidewalk before his shop front. By a belt transmission to his repair machinery, which is always going, the brush is kept revolving briskly, and a sign bears an invitation for the passer-by to stop and get his shoes brushed free. It requires only a minute to remove the dust from a pair of shoes.

TALL SKYSCRAPER FOR CINCINNATI

THERE is being built in Cincinnati for the Union Central Life Insurance Company a skyscraper which will be one of the tallest in the United States. The structure when completed will be thirty-four stories high and from the highest point to the street level will be over five hundred feet. It will cost nearly four million dollars.

THIRTY-FOUR STORIES HIGH.

The type of architecture will be Italian Renaissance. The first four stories will be white marble and from there up to the roof, white glazed terra cotta modeled in polchromatic work. The pyramidal roof will be divided into panels of colored terra cotta.

Over 6,500 tons of structural steel will be used in the massive frame which will be braced and riveted to withstand a wind pressure of more than two hundred miles per hour,—a velocity far greater than that ever recorded in Cincinnati.

TEA CULTURE IN JAPAN

TEA, the drink of tens of millions of people throughout the world, is drunk almost to the exclusion of everything else by the Japanese. It is asserted that this practice has considerable to do with the health of that sturdy race, and for two reasons. In the first place the boiling of the water kills the germs it contains; and in the second place the stomach is not chilled or shocked by the sudden invasion of a cold fluid as is that unfortunate organ when inside of an American. The illustration shows a vast field of the tea plant, under a high state of cultivation in Japan. The leaves are being picked.

GATHERING THE CROP IN A JAPANESE TEA FIELD.

CHICAGO ARCHITECT DESIGNS AUSTRALIAN CAPITAL

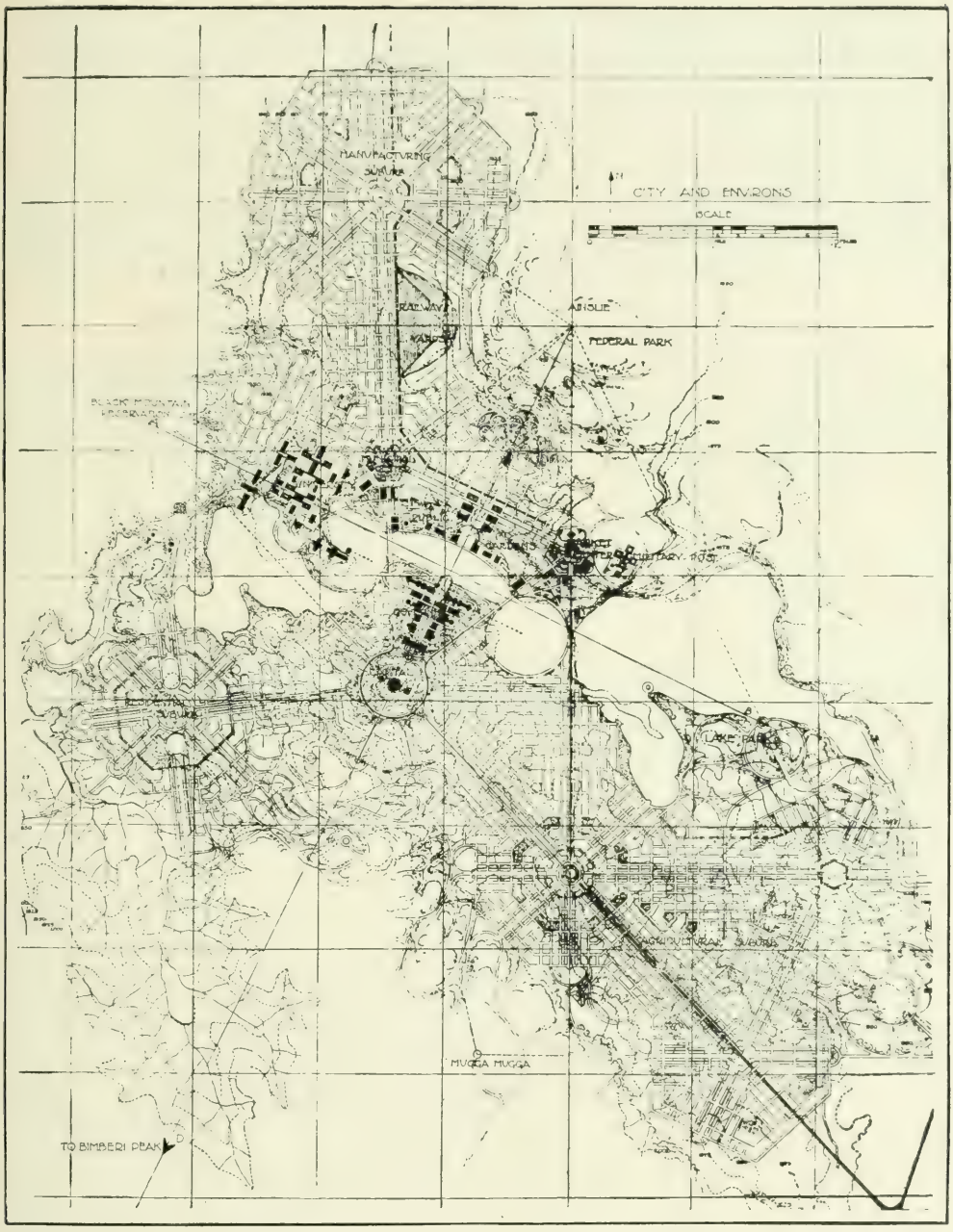
By Robert H. Moulton

WALTER B. GRIFFIN.

IT is not often that a young man jumps into fame over night or, to express it mildly, so quickly as Walter Burley Griffin, who has just been awarded the first prize in the international competition for a design for the capital city of the Australian colonies. Jumping into fame over night, however, does not do Mr. Griffin justice. There was the latent talent, backed up by push, energy, enterprise and industry.

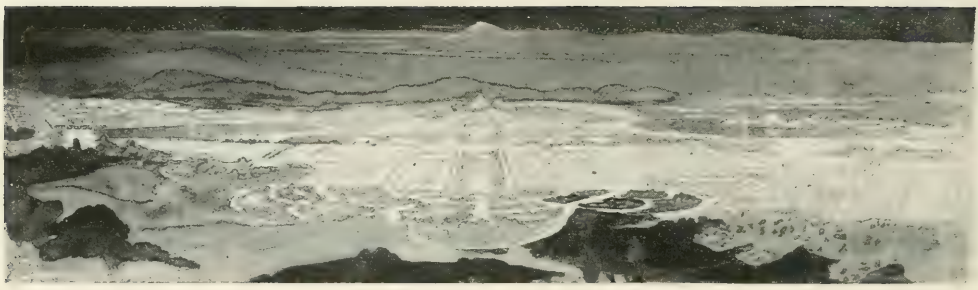
Mr. Griffin, who has just passed his thirty-fifth birthday, and who has been practicing independently only seven years, had as his competitors more than a hundred other architects, including some of the most famous designers of this country and Europe. What makes his success all the more remarkable, perhaps, is the fact that his plan was prepared in a much shorter time than was available by the majority of the other contestants. This was due to the fact that he did not learn of the competition, which was opened a year ago last June, until the following November. He spent only two months in work upon his plans, and finally submitted thirteen drawings, five feet by thirty inches. These included a general plan of the city and its environs, long sections through the city in two directions, and a perspective bird's-eye view of the city from one of the local mountains. His plan carries not only honor, but a cash reward of $8,750.

When the Commonwealth of Australia was created in 1900, one of the provis-



DESIGN OF THE NEW CAPITAL CITY OF AUSTRALIA.

ions of the constitution was that a new capital city should be established and that the site of the city should be in a federal district owned and administered by the Commonwealth and not by any one of the individual states. This arrangement is based upon that of our capital city of Washington, located in the District of Columbia. The territory selected is in the Yass-Canberra district of New South Wales and has an area of 900 square miles. The site is a mountain plateau 2,000 feet above the sea, and lies in a triangle formed by three mountains.



GROUND PLAN OF NEW CAPITAL.

The Australian capital, which has not yet been named, will be the first capital since Washington, D. C., to be planned in detail before a shovelful of dirt has been removed from its site. The success of Mr. Griffin's plans was perhaps due to the fact that his dream of a city was based not alone on architectural beauty, but was made to harmonize with the features of the surrounding landscape.

Mr. Griffin is a native born Chicagoan, and a graduate of the Architectural Department of the University of Illinois. He is a landscape artist as well as an architect, and his work has involved town extensions and garden subdivisions. A few years ago he prepared a design for a new city at Shanghai, China, when it was proposed to establish a modern city on a new site, and to abandon the old city, which is largely an insanitary collection of native huts. The delegate from the Chinese government to the St. Louis Exhibition had plans prepared by Mr. Griffin, but owing to the death of the delegate on his return to China, nothing was done toward carrying them out.

SITE OF NEW CAPITAL MARKED BY STAR.

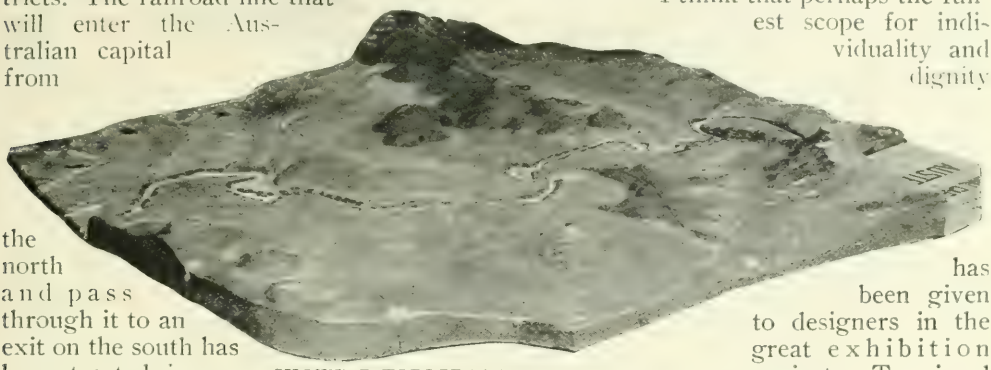
The plan prepared by Mr. Griffin for the Australian capital will cover an area of twenty-five square miles and provides for an immediate population of 75,000, with ample provisions for the growth of the city as gauged by the increase of population of other foreign capitals. The plan covers street railway system, steam railway line, business and manufacturing districts. The three mountain peaks about it will close the principal vistas and form a splendid background for its architectural beauty.

The Australian city is planned upon the radial type, with three principal centers, the government, municipal and mercantile centers — from which boulevards radiate. The outlying district will contain five additional centers. Three of these will be agricultural centers, one a manufacturing center, and another a suburban center.

One of the distinguishing features of the plan is that the residences built upon the streets lying between the great radial avenues will enjoy quiet and secluded park-like atmosphere and at the same time never be farther removed from the main business thoroughfares and the lines of local transportation than four

blocks. The city will have but one railroad entering it. All the freight yards, freight depots, and warehouses and transfer facilities will be located outside the city limits.

"Railroads that enter large cities," said Mr. Griffin, "mar their beauty and are often flanked by poor districts. The railroad line that will enter the Australian capital from the north and pass through it to an exit on the south has been treated in my plans with regard to beautifying rather than disfiguring the city. It is so arranged that it will run semicircularly around the business centers and will not at any point cut the main business streets.



SHOWING TOPOGRAPHY OF CAPITAL SITE.

"I do not know what type of architecture I should adopt. I have planned a city that meets my ideal of the city of the future, a city not like any other in existence, and in a way which I hardly expected any governmental authorities in the world would accept.

"I am what might be termed a naturalist in architecture. I do not believe in any school of architecture. I believe in architecture that is the logical outgrowth of the environment in which the building in mind is to be located. I have been planning houses in Chicago to meet Chicago's needs. They do not accord with the ordinarily accepted type of houses. They differ widely from the historical and usual types. I have tried to make them answer the needs of Chicago climatically and topographically.

"I have never been in Australia, but I have an idea of what the climate of Australia is. Consequently I have a vague idea of what sort of architecture I should recommend for the future Australian capital. But I am not yet prepared to go into details regarding it. Australia is a newer country than the United States. It has no architectural traditions. Its ideas of architecture are not influenced by any imported schools. I think in such a country, untrammeled by traditions, I ought to be able to evolve a very beautiful architectural type adapted to the needs of the climate and harmonizing with the topography.

"I think that perhaps the fullest scope for individuality and dignity has been given to designers in the great exhibition projects. Typical and best of these I consider the World's Columbian Exposition, at Chicago, with its ever memorable 'Court of Honor,' where the restriction to one colossal scale and single type of design around a rigidly formal inclosed court produced an impression outlasting those of all subsequent designs that have been exhibited.'

For the main material of construction reinforced concrete is proposed by Mr. Griffin, who remarks that this is the "newest, cheapest, most durable, least limited, most plastic and variable single medium yet introduced into construction." Any desired tint or character of exterior finish could be embodied in the concrete itself by the use of suitable aggregate in the facing portion of the concrete. Decorative features could be molded and cast separately. These methods have been used successfully, but the bold suggestion of their application on such an extensive scale as the public buildings of a great capital city indicates a recognition of the great possibilities of concrete in architecture as well as in engineering.

The site of the new capital is now practically a wilderness. The project offers the best opportunity the world has ever known for the development of a city along ideal lines and in accordance with modern principles of city planning.

Lt. Col. I. N. Lewis.
U. S. Coast Artillery.

TO FIRE FROM THE SKIES

By

ROBERT MORRISON

IN the early part of last June a group of United States Army officers stood watching an aeroplane as it soared aloft from the Army Aviation School at College Park, Maryland. The machine carried two men,—a pilot and a passenger. Between the knees of the latter was strapped a queer looking object, resembling somewhat a large inverted telescope with a disc-like attachment at the near end.

When the aeroplane had reached a height of 600 feet and was skimming along at a speed of fifty miles an hour, suddenly above the roar of the engine there came to the watchers below a quick, ripping sound. At the same instant a score of little dust clouds spurted up from the ground a few hundred feet away. This was repeated twice. Then as the aeroplane glided to earth, at the spot where the dust had risen, the officers ran forward to meet it.

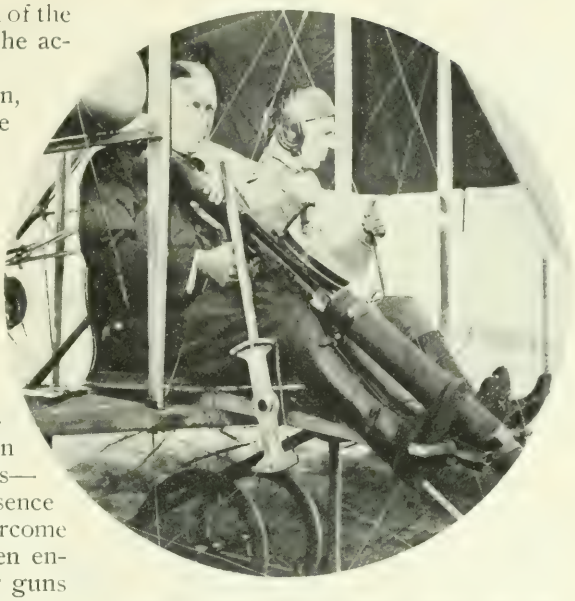
Firing the Lewis Automatic Gun from Stake.

On the ground lay a piece of cheese cloth, three yards by fifteen, punctured with numerous small holes. And then the secret was out. The curious looking object carried by the passenger was an aeroplane gun and the piece of cheese cloth was the target at which he had aimed while flying above at almost a mile a minute.

Careful examination of the target showed that out of the full magazine of fifty cartridges discharged by the gun operator, forty-five shots had hit the mark. The other five shots, the gunner explained, had been sent into a fish pond near by in or-

der that he might get, by the splash of the water, an instantaneous report of the accuracy of his aim.

This remarkable aeroplane gun, which experts declare will place armed forces of cavalry and infantry at the mercy of the flying birdmen, is the invention of Lieutenant Colonel Isaac N. Lewis, of the United States Army Coast Artillery Corps. Curiously enough, the gun was designed primarily for infantry and cavalry use. Later, however, Colonel Lewis was impressed with its possibilities for use in aeroplanes. Its light weight—the gun weighs less than twenty-five pounds—ease of manipulation, and the absence of flame and recoil, seemed to overcome all of the difficulties which had been encountered in connection with other guns designed for aeroplane use.



Capt. Chandler Firing Lewis Aeroplane Gun.

It was not difficult for Colonel Lewis, with his reputation as an ordnance inventor and an officer of sound and conservative judgment, to secure permission to have the gun tested at the Government aviation field. Volunteers were quickly forthcoming. Captain Charles De Forest Chandler, head of the army's aviation school, immediately offered to man the gun; and Lieutenant Thomas De Witt Milling, one of the army aviators, to drive the machine.

After descending from his victorious assault upon the imaginary enemy Captain Chandler was enthusiastic in his praises of the gun. He stated that there was no recoil whatever and that the gun was so evenly balanced by the magazine that his aim was not even interrupted while firing.

The gun can be fired at as high a rate as 750 shots a minute. It takes but four seconds to discharge a magazine of fifty cartridges, and the empty magazine may be replaced by a full one within two seconds. It might naturally be supposed that such rapidity of firing would soon overheat the barrel of the gun and render it temporarily useless. One of the distinguishing features of the gun, however, is a device whereby the barrel is kept continually cool by an automatically produced blast of air, thereby making it unnecessary to carry along an extra barrel of water for cooling purposes.

The barrel of the gun is surrounded by a close-fitting aluminum jacket, cylindrical in form and having some twenty deeply cut longitudinal grooves extending from breech to muzzle. Outside of this jacket is a light steel tube, 3¾ inches in diameter at the breech and 2⅞ inches at the muzzle end of the gun. The grooves in the steel jacket have full access to the atmosphere at the breech, thus forming a series of inclosed air ducts running entire length of the barrel. Each time the gun is fired the ejector action of the discharge blast sucks through these ducts, from the rear,

Firing Lewis Gun from Shoulder.

a draft of air which serves to carry off the heat transmitted to the jacket from the barrel. The idea in using aluminum for the jacket was not only on account of its lighter weight, but because it has six times the heat conductivity of steel.

The extreme simplicity of the gun is another feature which makes it peculiarly adapted for aeroplane use. It has only forty-seven parts, as compared with twice that number for other rapid-fire guns. The only tool required to disassemble or assemble the gun is the point of a bullet. This is an advantage of the greatest importance in the air, where but few tools can be carried and where they are needed in a hurry if wanted at all.

The Various Parts of the Newly Invented Aeroplane Gun.

The gun may be fired from any natural support found in the field such as a rock, log, stump, tree or mound of earth. It is even possible to empty the magazine while holding the gun to the shoulder or from the hip, as the recoil amounts to practically nothing.

The accuracy of the firing of the Lewis aeroplane gun on its first test was not only surprising in itself, but has aroused attention on the part of our Army and Navy experts to the fact that our battleships and the disappearing gun batteries of our coast defenses are completely unprepared for attack from the air. In the opinion of many, including Colonel Lewis, who is also the inventor of the Lewis depression position finder now used in the Coast Artillery Service, it marks the beginning of a development that is destined to produce radical changes in our land defense and coast armaments, both for offense and defense.

According to Colonel Lewis, an aeroplane costing not more than five thousand dollars will easily be able to carry the gun, two thousand rounds of ammunition, the gun operator, and the pilot. At a height of one mile or greater, and while moving at a speed of fifty miles per hour, it will be possible with this gun to pour in the most destructive fire upon the deck and fire control masts of our battleships, and upon unprotected personnel of our land defenses, without endangering the aeroplane or its crew—it being practically impossible to attack successfully the rapidly moving aeroplane from below. The gun also opens a new field of attack and defense in that it will be used as an offensive weapon against other aeroplanes similarly armed. It means that hereafter unarmed aeroplanes will no longer be used in war, even for scouting purposes.

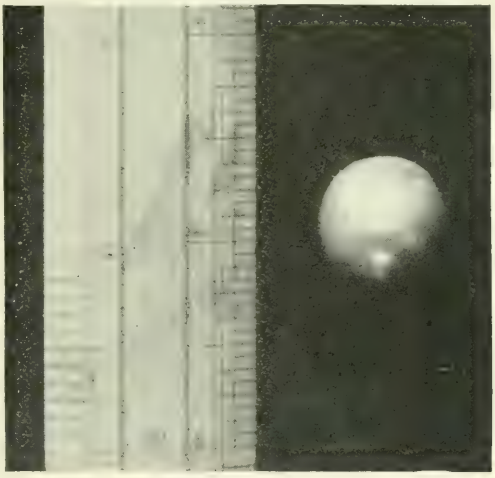
CREATOR OF PEARLS

ANYTHING is easy if one knows how, even the manufacture of pearls. Mr. K. Mikimoto, an ingenious Jap, for many years tried to find a means of producing pearls artificially. At last his study, skill and patience were rewarded and it is said that he has received a patent from the Japanese government, just as would the inventor of a piece of machinery, for his discovery. Mikimoto's method consists in catching the oyster when it is young, and literally performing upon it an operation, for into the tender substance of the bivalve he inserts an irritating substance. He then returns the oyster alive to its place in the sea.

WOMEN PEARL DIVERS OF JAPAN.

These young oysters live at a depth not to exceed seven fathoms. They cling to the stones and sea weed by means of a thread or film-like substance they spin. When they grow larger they are transferred to deep water. Vast beds are under the control of Mikimoto and no poaching is allowed upon these preserves. It takes about four years for a pearl fully to develop around the spot originally invaded by the foreign substance. The pearl is really a secretion deposited from time to time to ease the irritation caused by the foreign body. This hardens into the pearl of commerce.

To assist in the pearl industry women divers are employed and they are found more skillful than men.



SAMPLE OF ARTIFICIAL PEARL.

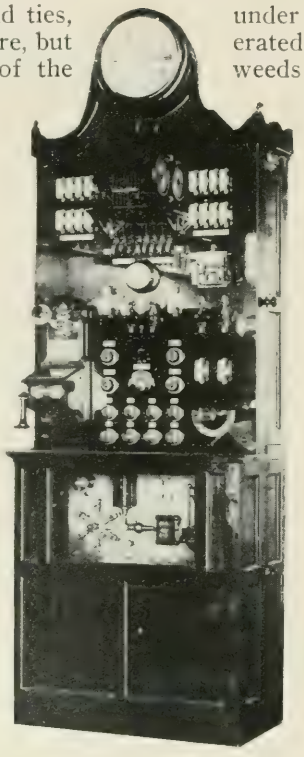
STARTING AN ARTIFICIAL PEARL.

GETTING RID OF WEEDS

A WEED-BURNING train has been installed on the Pacific Electric Railway that is unique in many ways. The present outfit consists of an electric locomotive, a couple of tank cars, one carrying crude oil and the other water, and a flat car on which the oil burner is installed. As the car passes over the right-of-way, it burns the weeds between the ties and on both sides of the track and immediately quenches the flame by means of a spray of water. In this way, the fire is prevented from spreading and getting into fields outside of the right-of-way, and any decayed spots in the ties that may have begun to smoulder are kept

from burning. For the sound ties, there is no danger from the fire, but on the contrary, the grain of the wood is seared and the life of the tie prolonged by this treatment. The burner uses cheap crude oil and burns a strip from sixteen to twenty feet wide out to the sod line at a cost for oil of about eighty cents per mile.

The machine consists of a steam boiler, two 500 gallon, high pressure tanks for oil, a heater, several rows of burners, a cemented cover under the car having the dimensions of ten by thirty feet, and wings which extend from the side of the car and are also protected from the intense heat by a coating of cement over metal lath. The most important feature of the device is a mixer in which steam from the boiler and oil from the tanks are brought together under pressure and heat, forming an intensely hot gas. This is conveyed to the burners under the car, and the heat generated is so fierce that green or wet weeds are instantly destroyed.

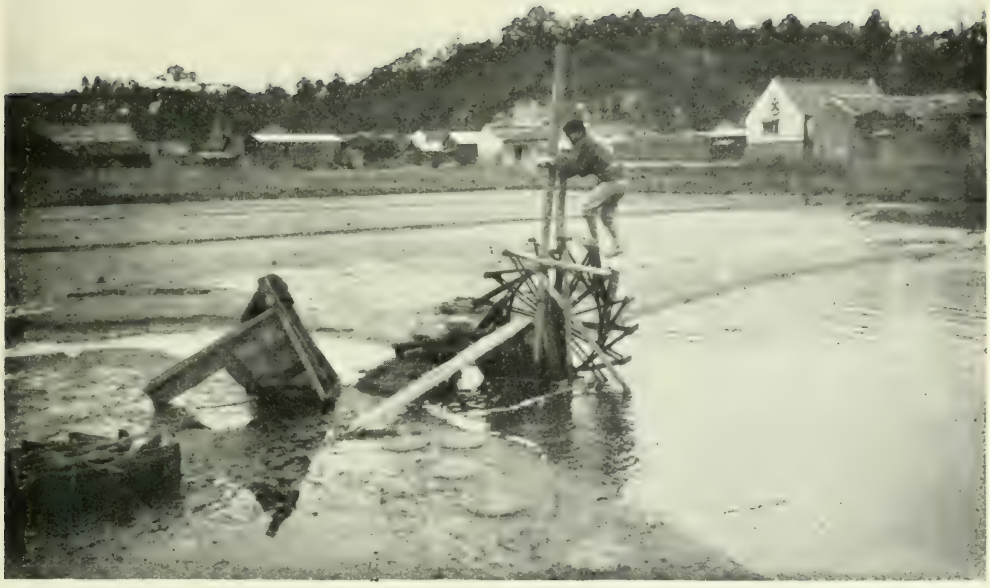


THE AUTOMATIC FIREMAN.

AN AUTOMATIC FIREMAN

TO abolish the necessity for a fireman remaining upon station duty at night time, Superintendent Woods of the Grimsby fire brigade has designed an ingenious electrical contrivance to perform all the functions which such an officer would have to carry out. On receipt of a fire call the mechanism rings the electric alarm bells fitted in the firemen's bedrooms; it switches on all lights in the fire station and unlocks and flings open the station doors. The firemen have only to mount the motor engines and dash off to the scene of the outbreak. Having performed these duties the machine automatically sets itself again in readiness for the next call.

WEED DESTROYING APPARATUS FOR RAILROADS.



PRIMEVAL IRRIGATION METHODS IN JAPAN.

WHERE TIME IS NOT MONEY

IF you want to find a place where time is of no value whatever, you have to go to India, China, or Japan. Here the laborer is surely worthy of his hire, toiling as he does from morning till night for the meager pittance of about fifteen cents a day—or what even an economical American would spend a day on cigars. In the illustration we are shown a crude, laborious, but, nevertheless, ingenious method in vogue among the Japanese to irrigate their rice fields. As will be noticed, a sluice or ditch is dug to connect with a river. A miniature dam is then erected across the mouth of this ditch, a small aperture being allowed only for the water wheel. A couple of posts are driven into the sands. A man then steps upon the blades of the water wheel. His weight, of course, starts it to turning, with the result that the water is raised from the river and precipitated into the sluice. It is a veritable treadmill process that is often kept up all day. The posts are for the purpose of the man's holding onto something for support.

Such primeval water wheels are scattered all along the banks of many oriental rivers,

GUN TO KILL WASPS

AN ingenious weapon which has just been put on the market is herewith shown in the photo. It is called a "wasp gun" but can be used for killing flies and other insects. In appearance the gun is something like an ordinary pistol, but instead of firing ammunition it catches the insect between two flat metal jaws and kills it instantly and painlessly, directly the trigger is pulled. Many women in England well known in the social world have already purchased these guns. Indeed her majesty the queen is said to have bought one of the tiny weapons.

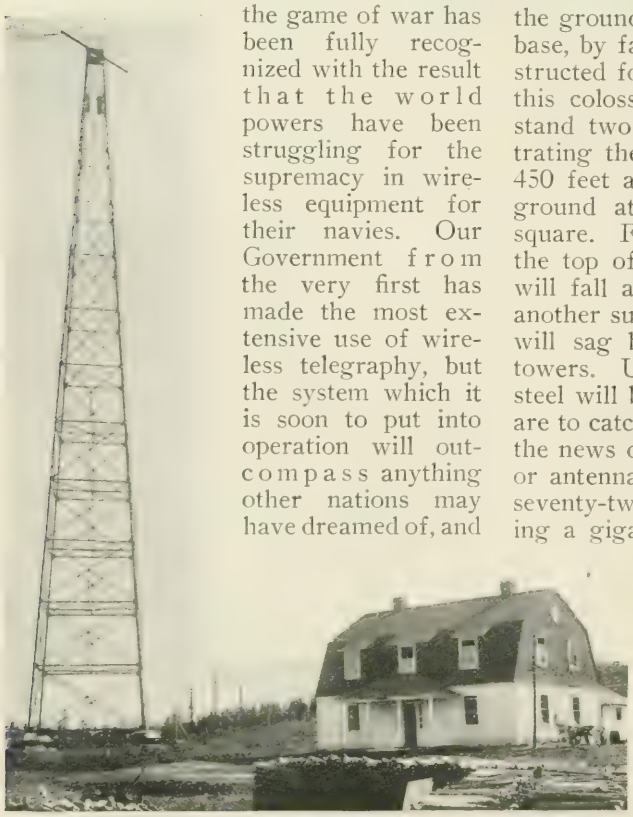
GUN FOR KILLING WASPS.

GOVERNMENT WIRELESS AROUND WORLD

By

FRANK N. BAUSKETT

DURING the Boer war Marconi accomplished the great feat of sending wireless messages with a good degree of accuracy a distance of twenty miles. The world wondered. A half dozen years later this great inventor again startled the world by sending his message both across land and sea without the aid of wire, and from that time on, the importance of this mysterious mode of communication in the game of war has been fully recognized with the result that the world powers have been struggling for the supremacy in wireless equipment for their navies. Our Government from the very first has made the most extensive use of wireless telegraphy, but the system which it is soon to put into operation will outcompass anything other nations may have dreamed of, and will make the United States proprietor of a system of communication covering more than half the globe.



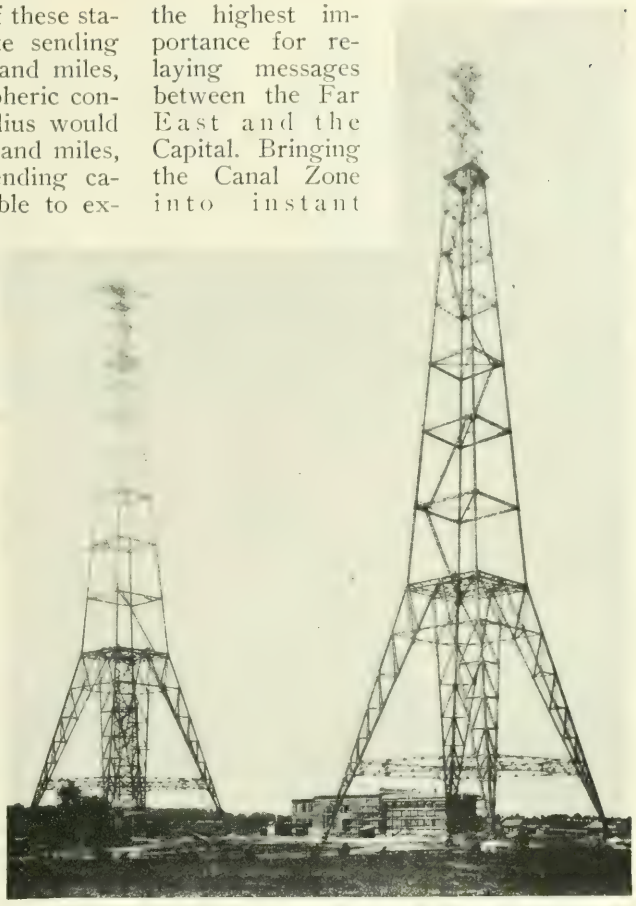
UNITED STATES WIRELESS TOWER IN ALASKA.

The first of the big stations comprising the system is located at Arlington, Virginia, about two miles from the Navy Department at Washington, and consists of three huge steel towers very much resembling the Eiffel structure at Paris, which by the way has lately been converted into a wireless station. The tallest of these towers will rise 650 feet from the ground and is 150 feet square at the base, by far the greatest tower ever constructed for the purpose. To the east of this colossus and equidistant therefrom stand two similar towers of steel penetrating the atmosphere to the height of 450 feet and spreading over a space of ground at the base of each, 120 feet square. From the apex of the tallest to the top of each of the lower structures will fall a cable 460 feet in length and another such rope of steel, 800 feet long, will sag between the tips of the twin towers. Upon these suspended cords of steel will be spread the giant nets which are to catch the dots and dashes bringing the news over land and sea. These nets or antennae will consist of a half dozen seventy-two foot spreaders, each supporting a gigantic aeolian harp of nineteen wires four feet apart.

The design adopted for the Arlington station will be followed in the construction of the others which are to complete the chain of the system. These stations will be built at the Panama Canal Zone, San Francisco, the Hawaiian Islands, Tutulia Island in the Samoas,

Guam, and at Manila. Each of these stations is to have an accurate sending radius of at least three thousand miles, which means when the atmospheric conditions are just right this radius would be increased one or two thousand miles, but even at the minimum-sending capacity each station will be able to exchange messages with the next adjoining station, thus completing the chain of transmission between the Orient and the West embracing two oceans and a continent within the links of this chain.

As the seat of naval authority, from which the movement of all vessels is directed, Arlington, which is practical Washington, is the logical place for the location of the most powerful means of communication with the fleets which can be devised. The military reservation across the Potomac from the National Capital offered a convenient site for the station, and the telephone will bring it as close to the Navy Department in effect as if the towers were erected on the roof of the State, War and Navy Building. The range of the Arlington station will practically cover the entire Atlantic ocean, the principal scene of operations of the battleship fleet. The naval base at Guantanamo, Cuba, falls easily within the range of this station, as will regular communication with the station at Panama. San Francisco, on the other side of the continent, also will be within the range, facilitating communication with ships in the Pacific. At present orders to the fleet in the Atlantic have to be relayed through Norfolk or Key West and the commercial land wires must be used to San Francisco. The station when erected at the latter place will be able to talk with Washington, Panama and Hawaii, besides the numerous small stations scattered over Alaska. Having direct communication with Washington, the station will be of the highest importance for relaying messages between the Far East and the Capital. Bringing the Canal Zone into instant communication with Washington is considered by naval authorities to be vastly important, with the approaching completion of the Panama Canal. The Canal Zone is destined to become the scene of naval, military and commercial activity, and of the highest importance as a strategic possession of the United States. The Panama Canal Station will have direct communication with the stations in this country and will afford an excellent means for directing operations in South and Central American waters.



GOVERNMENT WIRELESS TOWERS THAT HAVE BEEN ERECTED IN VIRGINIA.

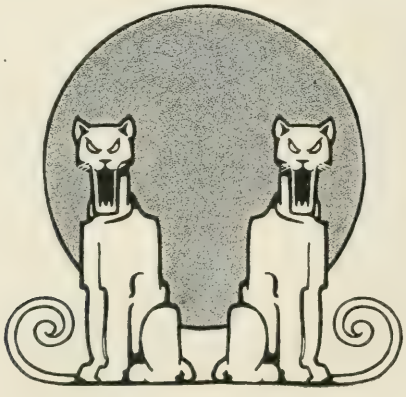
Hawaii is referred to as the "Key of the Pacific," and there the United States is constructing a great naval base; thus independent communication between the Navy Department and Hawaii is of vital importance. To Guam is the next link in the chain. Here the government has

CLASS IN WIRELESS FROM ENLISTED MEN OF NAVY.

a coaling station. From Guam to Manila is only a step, so to speak, and the station there will be within easy communication with points on the coast of China and Japan. The entire series of stations when completed will have cost the government more than a million dollars, some two hundred thousand dollars having been expended on the Arlington Station alone.

In the building erected in connection with the big station, besides the engine and power rooms, machine shop and two wireless laboratories, there will be accommodations for twenty operators and a commissioned officer of the Navy, who will be detailed to command the station just as though it were a ship; and there will not be a minute of the day or night in which a corps of operators are not alert to pick up signals and messages shot in from the four quarters of the globe.

This gigantic wireless scheme was planned by and is under the supervision of Rear Admiral Hugh I. Cone, Chief of the Bureau of Steam Engineering of the Navy Department; and the architectural and engineering work is being carried out under the immediate direction of Mr. Carl Alexius Carlson, of the Bureau of Yards and Docks.



BIRD FISHERS

CORMORANTS IN CAGES.

CORMORANTS FISHING.

OUR geographies used to tell us that the cormorant was a water bird used in the Far East for the purpose of catching fish. The story was always half-regarded by the pupils as a fairy tale. As a matter of fact, however, the thrifty people of both China and Japan have for many years, possibly centuries, put the cormorant to this very use. The illustrations show something of the nature of this curious practice. The photos herewith printed were taken in Japan. When the fisher folk are about to go forth upon the water they put their cormorants into baskets and carry the birds along with them. These baskets are covered. Once on the fishing grounds the fishermen take out the birds and send them into the water. As each one of the birds seizes upon some member of the finny tribe, he closes his bill upon it, retains his struggling prey in the pouch that lies beneath the lower mandible, and bears it to his master awaiting him in the boat. Upon depositing the prize the bird immediately returns to the water for another fish. Each bird according to his age or length of service knows his duties, rights and privileges, and woe unto any one of his companions that fails to recall these distinctions. The birds are highly prized by their owners and some of them—those that show unusual proficiency in the work—are placed at a premium.

BUBBLING SPRINGS OF OIL AND ASPHALT.

An oil and asphalt spring that has been flowing for untold ages is one of the phenomena of the East coast region of Mexico. It is situated in the heart of a tropical wilderness not far from the Tuxpan river, in the state of Vera Cruz.

GERMLESS WATER COOLER

WHILE in the home or office there is not the danger from the use of a general drinking cup that might be expected from the promiscuous use of all classes of people, yet even there the common drinking cup is unsanitary.

In the interests of universal health and pure drinking water a well known manufacturer of water coolers has designed and placed on the market a sanitary fountain or bubbler as it is now generally called.

The bubbler insures absolutely pure water without danger of outside pollution, is economical and easy to keep in order. A good idea of its operation can be gotten from the illustration. To start the water one simply pushes the button on the end of the faucet, causing the water to bubble up at the head so that a drink can be taken easily and naturally without the drinker's lips coming in contact with anything except the pure water.

The water spout is surrounded by a metal cup which prevents the water from overflowing and the flow is so regulated that the fountain bubbles but does not splash. Any waste water is conducted to a waste bucket on the lower part of the cooler stand by means of an overflow pipe.

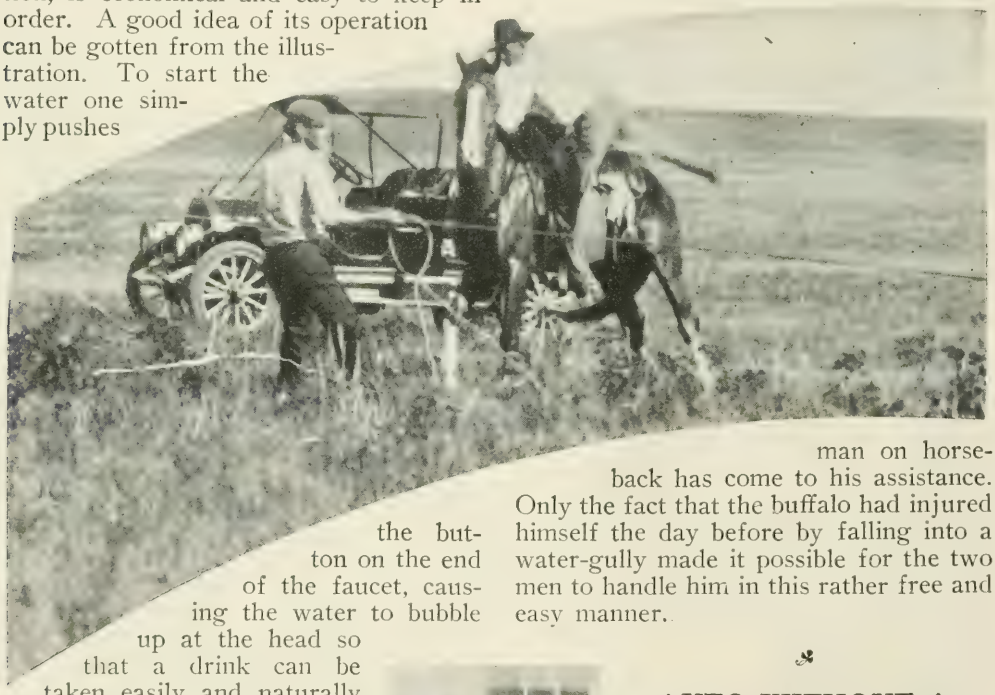
The metal parts of the bubbler are finished in nickel and give the fountain a clean and attractive appearance.

The new fountain is being quite generally adopted in office buildings

BUBBLING FOUNTAIN.

BUFFALO AND AUTOMOBILE

THIS striking photograph brings into strong contrast the new and the old on the Western plains. A cowboy in an automobile has driven out onto the buffalo range of Major W. Lillie's ranch, near Pawnee, Oklahoma, and has succeeded in roping a young bull. Another man on horseback has come to his assistance. Only the fact that the buffalo had injured himself the day before by falling into a water-gully made it possible for the two men to handle him in this rather free and easy manner.



AUTO WITHOUT A DIFFERENTIAL

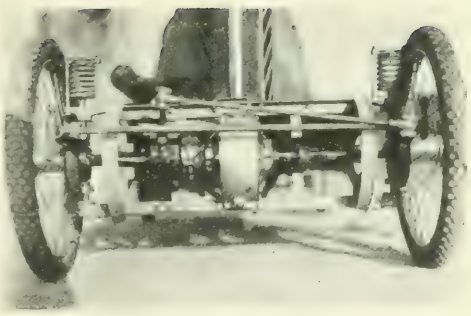
AN automobile without a differential, driving through the front axle, and developing a speed of considerably more than sixty miles an hour, despite the fact that it weighs less than six hundred pounds, is one of the latest novelties in American motoring.

It was designed and built for racing purposes by George

De Witt, who has won several races against larger cars.

The front drive principle is calculated to do away with the tangental motion which makes skidding at curves so common with cars of the standard variety. The rear wheels, having the power in them start a course off the curve, and the turning of the steered wheels instead of stopping that motion place the car in such a position that the onrush of the powered wheels in the tangental direction is beyond all control of the driver.

It is DeWitt's contention that having the power applied ahead of the bulk of the vehicle, the driving wheels can go in no direction where they will be beyond the instant control of the steering apparatus. The moment a tangental motion is set up, the steering wheel points the power toward a second tangent and so on until the curve is completed. Thus the skidding serves in itself to aid the car around the turn without a reduction of speed.

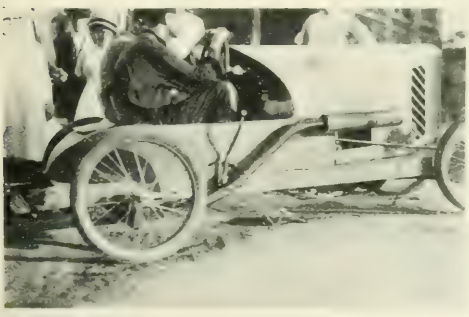


Auto Without a Differential.

The differential has been left out of the designer's calculations. He argues that no automobile engineer has ever seen the necessity for a compensating device in the front axle and that the light weight of his car makes one in the rear superfluous. The little machine is balanced like a monoplane, and when in motion the rear wheels scarcely touch the ground.

The gasoline tank is suspended under the long cigar shaped hood over the engine. The brakes are applied to the axle instead of the wheels. The clutch is of the multiple disc type and the transmission selective. Four universal joints in the front axle render it absolutely flexible and make steering easy at all speeds.

Mr. De Witt hopes to make his demonstration of the merits of the new car so plain that some of its features will be generally adopted.



Weighs Only Six Hundred Pounds.

TO PREVENT MINE EXPLOSIONS

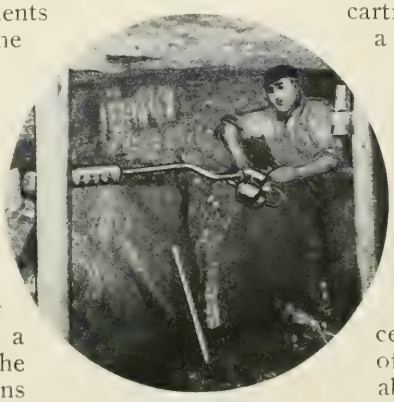
By

J. HARTLEY KNIGHT

IT has taken a long time for the hydraulic cartridge to make its way, as a substitute for explosives, in the coal fields of England, but there are indications that it is now coming into general use and that ere long this scientific method of loosening coal, rock, etc., with greater safety to surrounding structures and workmen will be permanently adopted. Briefly put, the system is that of hydraulic pressure, by which great power may be gradually attained by means of a tube filled with water. The hydraulic cartridge in its present form is the invention of the late Mr. James Tonge, a British mechanical engineer, who first called a sceptical world's attention to its undoubted merits as far back as 1898. Since that time, however, many improvements have been effected on the original apparatus. Thus the pistons are now made telescopic — an inner working within an outer—and the old lever-operated pump (which was such a feature of the original invention) has been replaced by a screw pump, which obtains a greater pressure on the water, as much as six tons to the square inch being obtainable by this manner of doing the work.

ACTUAL PHOTOGRAPH OF A MINE EXPLOSION.

The hydraulic mining cartridge, which has been chiefly designed to supply the need for a different method of bringing down coal after it has been undercut, has many advantages over the high explosives used in the getting of coal. Obviously, its greatest feature lies in its absolute immunity from danger. By its use coal can be brought down at all hours of the day, thus avoiding night work for such a purpose. There is no shaking of the roof or damage to doors from vibration of air through fast shots; there is practically no dust or loss of time through missed shots, and an entire absence of noxious fumes.



HYDRAULIC CARTRIDGE IN USE.

So effectually does the hydraulic cartridge do its work that in a seam using fine cartridges 450 tons of coal are produced per day, of which 75 per cent is large coal and 25 per cent small. If in the same seam the coal is brought down by explosives, the percentage of large coal invariably decreases to about 65 per cent, whilst the percentage of small coal increases to about 35 per cent. It is claimed that an extra price

per ton is gained for the coal brought down by hydraulic cartridges on account of its greater hardness and freedom from dust.

In using the hydraulic cartridge, it is of course essential that the coal should first be undercut. After this is done, or simultaneously with the undercutting, the holes are drilled slightly less in depth than the undercut, parallel to and against the roof. The hole is then thoroughly cleaned with a miner's scraper, and the steel liner laid in the hole with the "L" shaped end innermost. The cartridge, with pump and pipe attached is then placed on top of the liner, and both are pushed to the back of the hole. The water tank is filled and hung on the pipe, the stop-cock beneath the water tank opened, and the suction hose coupled, the normal position of the screw handle and pump plunger being assured by pushing the pump plunger in as far as possible, and then unscrewing the large screw handle until it meets the head of the pump plunger. The release valve on the upper left side of the pump is then opened, and the pump plunger slowly drawn back, and rapidly forced inward, three or four times, until a full stream of water, free from air, is ejected from the drain pipe. Then, when the pump plunger is in, the release valve must be closed tight, in order to prevent leakage, and the pumping process repeated until the resistance has made further stroke compression impossible. The pump plunger is then withdrawn, and the screw handle rotated to the right for its entire length. With the right hand resting lightly against the pump plunger to hold it in position, the screw handle must be rapidly rotated back to its normal position. The process is then repeated until expansion of the pistons has been reached, or the coal has fallen.

As the pressure increases, the coal will begin to crack, until long seams and splits appear in all directions. The maximum pressure is obtained at the moment the elastic limit of the coal is reached, and shortly thereafter it falls in large lumps, rarely too large for one man to handle, and free from powder fracture or slack. The release valve is then opened, and the pistons are pressed back into place, the water returning to the tank through the drain pipe. Should the coal be only broken loose but not down, with the first hole, and it is desired to place the cartridge in the second hole, the pistons may be returned to place by opening the release valve, permitting the water to escape, and then rapidly working the cartridge up and down in the hole. As soon as the pistons are in position, the cartridge is ready for the next hole.

AFTER A GREAT EXPLOSION—WAITING FOR THE RESCUERS.

Fifteen or sixteen years ago when Mr. Tonge first introduced the hydraulic cartridge quite a number of "safety explosives" were on the market, some of which were more curious than practicable. One of these was a water cartridge, which was named after its inventor, Mr. J. J. Speakman, and which, it was claimed, could be fired without flame and its attendant risk. The outer case of the Speakman cartridge consisted of a tin tube 13 inches long by 1¾ inches in diameter, sufficiently rigid to prevent crushing down during the operation of fixing and tamping. The tin tube was filled with water and the charge of explosive, which was placed in the water, was partially suspended over the bottom of the tube by means of an electric wire which connected the detonator in the charge with the battery used for firing, the wire passing out through one end of the tube. When the tube had been filled with water and the charge of explosive placed in position, the open end was securely closed by means of a bung. The cartridge was then placed in the shot hole and tamped in the ordinary way. The charge of explosive when in the cartridge lay in such a position as to be almost completely surrounded by water and by thus placing the charge on the bottom of the cartridge there was a much greater head of water for extinguishing any flame that might arise when the charge exploded.

Plutarch's Sayings

¶ Simonides calls painting silent poetry, and poetry speaking painting.

¶ We are more sensible of what is done against custom than against nature.

¶ The measure of a man's life is the well spending of it, and not the length.

¶ Cato said, "I had rather men should ask why my statue is not set up, than why it is."

FURNISHING A TOWN WITH SHADE TREES

THE town of Farmington, Maine, has a most novel plan for furnishing the village with shade trees. Various people, whether residents of the town or not, set out the trees and maintain them.

This was brought about in this way. In 1885 the village suffered a severe fire, the principal business blocks being wiped out, together with a large part of the residential section and the beautiful shade trees that had been growing for years. The town couldn't afford to replace these trees, so some one devised the scheme of letting people interested in the town contribute towards setting out new ones.

ALL TREES ARE NUMBERED IN FARMINGTON.

To stimulate an interest in the maintenance of these trees, it was decided that each person giving a tree should have his name placed upon it in big letters. This worked like a charm and people from all over the State responded, among them being Ex-Governor Dingley of Lewiston and other prominent men. These signs beginning to be pretty thick and the boys using them for targets, finally a plan was made of the trees with their location, and each tree was allotted a number on the plan, with the name of its sponsor. As a result of this scheme Farmington now bears the distinction of having the most beautiful shade trees of any town in the State of Maine.

PROTECTION FOR THE HORSE

THE queer device shown in this photograph is a shade for the protection of horses against the mid-summer sun. Although the small shade which protects a horse's head is now a common sight, this shelter which extends from the ears to the tail is unique. It is of light oilcloth on a metal frame and is arranged so that it can be readily attached to the shafts of a rig. The device is the invention of a Californian, and the photograph shows him seated behind his pet buggy horse.

SUNSHADE FOR HORSE.

MOVING DAY IN JAPAN.

MOVING DAY IN JAPAN

MOVING day has no terrors for a man of the people in the land of the Japs. The head of the house picks up the screens, and the wife carries the table and broom and the "Japanese" lantern. That is all there is to it.

MAKING ROADS IN WASHINGTON

ROAD-MAKING in the state of Washington, especially in the heavily timbered sections, is no sinecure. It takes real men, a lot of hard work, and no little thinking to put a road through in many places where roads are not only wanted, but badly needed.

The automobile is responsible in this state for much of the new undertakings, and there are many miles of fine highway for automobiling in the state. Still, with all that has been done and is now being done, it will be a long time before some of the more remote localities are satisfactorily opened up. The state has taken a great interest in road building, and is lending its aid in every way possible, not only to get new roads, but to help in maintaining in faultless form those that are now in use.

In building roads through the fir forests the great friend of man is the traction engine and giant powder. After the trees are felled the engine comes in handy in pulling stumps that have been loosened by charges of powder and in dragging off the logs and underbrush.

Logging camps have helped wonderfully in adding to road mileage of the state. The loggers are compelled to build roads as they work into the forests to take out timber for the mills, and afterward by a little work and expense these trails are transformed into really serviceable roads.

Four large quarries, fully equipped with stone crushing machinery, have been opened by the state and are manned by convicts from the state penitentiary. These quarries furnish road building material for state roads.

FINE ROAD THROUGH WASHINGTON FOREST.

BUILDING A ROAD IN WASHINGTON FOREST.

GATHERING THE RAW MATERIAL.

IN A CHICKEN FACTORY

By

FRANK PARKER STOCKBRIDGE

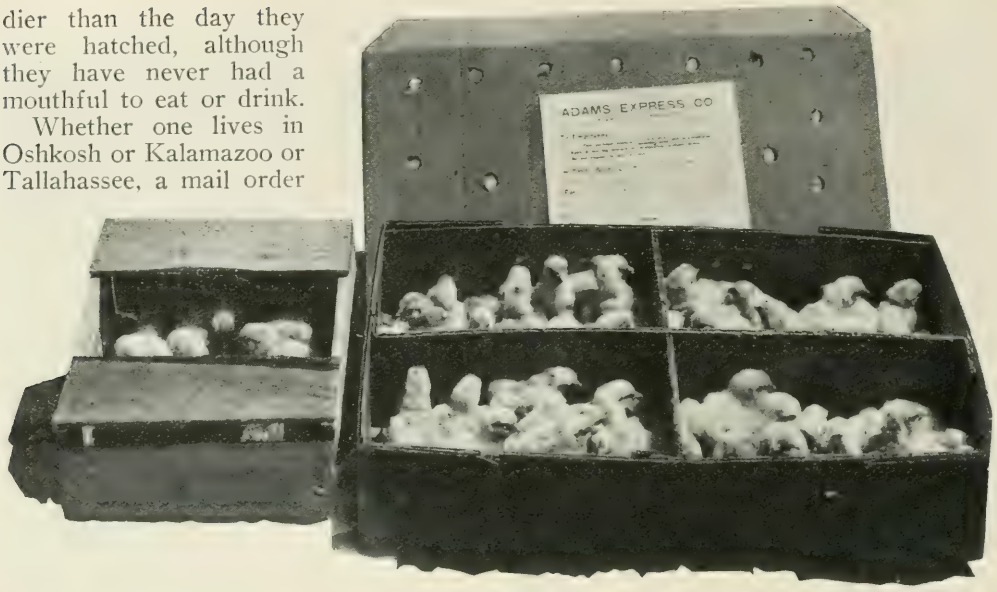
THE chicken factory has arrived, to take its place along side of such other industrial establishments as the cotton mill, the iron foundry, or the saw-mill. Of the $1,250,000,000 invested in the production of poultry in the United States, more than $5,000,000 is represented in the production of chickens, often literally in carload lots, as a purely manufacturing enterprise.

One who wishes to raise chickens, either for market or as egg-producers, no longer has to bother with incubators or setting hens. All that is necessary is to send to any one of the big chicken factories—there are a dozen of them within an hour's ride of New York City—and order as many baby chicks as there is room for in the pens and feeding-yard. The chickens will be shipped by express, all alive and stronger and stur-

ONE THOUSAND BABY CHICKS—COUNT THEM!

dier than the day they were hatched, although they have never had a mouthful to eat or drink.

Whether one lives in Oshkosh or Kalamazoo or Tallahassee, a mail order



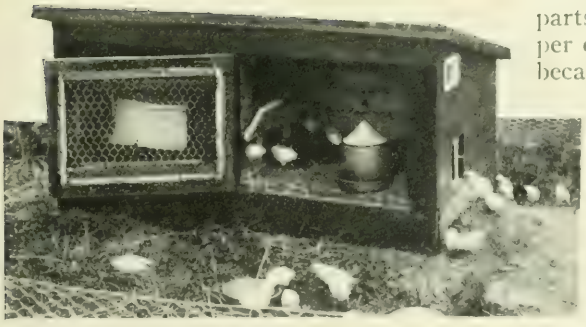
READY FOR SHIPMENT.
Baby chicks are packed in wooden trays with cloth covers for long journeys.

for baby chickens, by the dozen or the hundred, will be filled just like an order for any other commercial commodity, and the tiny creatures will be delivered by the expressman in the regular routine of his business, all done up in cardboard packages, just like any other kind of merchandise. And like other merchandise, the baby chickens are manufactured by artificial processes from the raw material in great industrial plants that are as different from the old-fashioned poultry farm as any factory is different from any farm.

Of course, the farm still has to supply the raw material. Nobody has yet succeeded in making artificial eggs that will hatch chickens as well as the old-fashioned eggs produced by the humble hen. But the cotton mill, too, must get its raw material from the farm and in this respect the modern chicken factory is no different from other kinds of factories.

Exactly what has happened in the last five years is that the chicken industry has become industrialized. Just as the old-fashioned cottage weavers have given place to the power-looms of the big mills, so the domestic chicken plant is doomed to extinction. More hens are being kept than ever before, but they are more and more being maintained merely as sources

AT THE END OF THE JOURNEY.



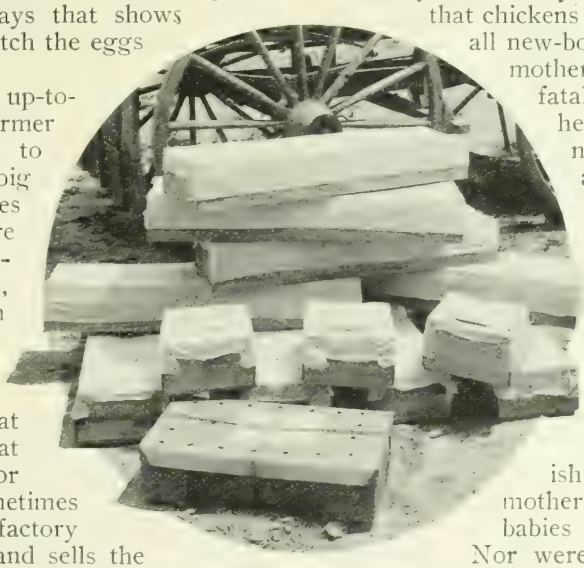
The Artificial Hen Mother.

of raw material. The modern pure-bred hen has developed into an egg machine, with most of the instincts of motherhood bred out of her. It is the exceptional hen in these days that shows any desire to hatch the eggs she has laid.

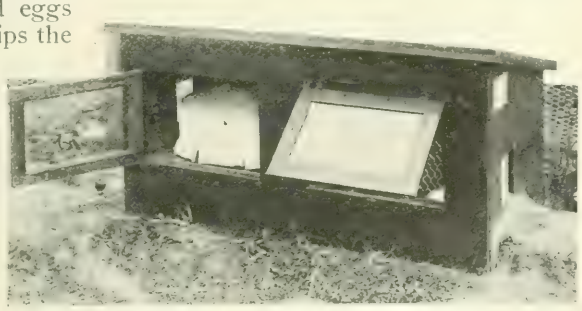
Today the up-to-date poultry farmer sends his eggs to one of the big chicken factories where they are hatched in mammoth incubators, operated with the same methodical and systematic routine that prevails in a great machine shop or cotton mill. Sometimes the chicken factory buys the eggs and sells the finished product — namely, chickens—just as the cotton mill buys the baled cotton and sells the finished cloth in the open market. Sometimes the factory merely charges the farmer a small price per hundred eggs for its services in hatching, and ships the chickens to the consignor of the eggs, by the same transportation machinery that carries cotton goods or tenpenny nails, and with just as little risk of loss or damage in transit.

This shipping of live chickens by express has already assumed staggering proportions. In 1911 more than 200,000,000 baby chicks were shipped to all parts of the United States. Not three per cent of these tiny travelers died or became ill on the trip and they required no more care than the general run of express merchandise. Compared with shipping plate glass, the transportation of baby chicks is one of the easiest things the express companies have to tackle. And the establishment of this "infant" industry on a firm commercial footing is proved by the fact that banks will now discount sight drafts drawn against bills of lading for shipments of baby chickens.

The new industry is based upon the discovery made only a few years ago, that chickens are the hardiest of all new-born creatures. The mother hen makes the fatal error of taking her babies out of the nest as soon as they are hatched and feeding them bugs and worms and all sorts of trash they should not have. It should be said in apology for the hen, however, that in this respect she is no more foolish than many human mothers who feed their babies beer or bananas. Nor were poultry breeders themselves any wiser than the hen. Acting on the natural assumption that the hen knew best what was good for the chickens they fed the newly hatched infants on cornmeal



A Few Thousand Travelers.



Another View of the Artificial Hen.

and water. It became an axiom among poultry breeders that you were lucky if half your chicks didn't die the first week.

Then scientists studied the organism of the baby chicken and discovered that food was not only unnecessary but injurious in the first few days of its independent career. The last thing before the chicken leaves the shell, it absorbs into its stomach the entire yolk sac of the egg, which provides food and drink for from four to six days. Anything else taken into the chicken's stomach during that time causes digestive disturbances that frequently prove fatal.

Because of this characteristic of the baby chicks it is possible to ship them to any point that can be reached by express in from four to five days and have them arrive in perfect condition. From the factories they are started on their journeys within six hours after hatching. In the great incubator cellars, where temperature and other conditions conducive to the proper hatching of chickens are more perfectly regulated than nature itself can accomplish, a thousand chickens will pop out of the shells almost at the same instant. As soon as they have been properly dried they are put into paper boxes, from twenty-five to two hundred chickens in a single receptacle, and tossed into express cars along with other merchandise. The boxes have compartments, each holding twenty-five chickens, and holes for ventilation, but the chicks need no food, light, or attention and unless suffocated or crushed in transit, they survive the journeys in stuffy express cars in much better shape than human beings would.

One of the large chicken factories in New Jersey has an incubating capacity of more than 100,000 eggs at a single hatching. One incubator in this factory holds 50,000 eggs. There are several other large establishments equipped with these gigantic incubators and converting the raw material into the finished product at the rate of more than 10,000 chicks per day, the year around.

The poultry raiser who formerly bought settings of eggs to improve his stock, now finds it more economical and satisfactory to buy baby chicks. There is less danger of loss in transit and a better guarantee that he will have live chickens instead of a collection of second-hand eggs. The common run of baby chicks are sold at 10 to 15 cents, but in the blue ribbon grades they cost from two to twenty dollars each. But no matter what the grade, this is a much cheaper way than that of buying the eggs and taking chances on domestic incubation.

Some of the big incubator concerns do a large business in taking in eggs "on shares." Oddly enough, that branch of the business—custom hatching—is older than the Christian Era, for in ancient Egypt, more than 2,000 years ago, incubators were constructed on a huge scale, even larger than the modern type, and heated by oil lamps and sun heat. Aristotle, in 300 B. C., wrote very entertainingly about these big incubators. According to his accounts the Egyptian "hatcheries" demanded the best chick out of every four hatched. The modern practice is to charge a fixed amount for every egg or every chick hatched but the cash price does not equal the fees of the ancients.

HALF A MILLION DOLLAR SHIPMENT OF FARM TRACTORS.

TRACTORS FOR CANADA

UNTIL recently there were said to be in all the Western provinces of Canada only four dollars worth of tractors for every man, woman, and child in the district. With the opening of a new line of railway from St. Paul to Winnipeg the first train carried a load of tractors valued at half a million dollars.

The train was composed of 102 new flat cars, two locomotives, the necessary cabooses for the crew, and cars for the officials of the road who accompanied the train. The shipment contained 101 oil tractors, 61 threshing machines, or separators as they are called, and 131 kerosene tanks. The total weight on the cars was 1,700 tons.

Of course the freight rate on this large shipment materially increased its cost and before it reached its destination the Canadian government was richer by $62,000 in customs duties.

Each tractor in the big train load has a capacity equal to preparing from 640 to 1,000 acres of raw land and of handling every step of the production of the crop from ploughing to threshing and hauling to market.

Two hundred million acres of land lie in a virgin state in Western Canada waiting for power and the plough, and enormous quantities of tractors and gang ploughs are being shipped.

BIGGEST WATERMELON EVER PRODUCED.
It weighs 300 pounds and was grown in Colorado.

IN THE NEW ROOF GARDEN

ROOF GARDEN ON HOUSE

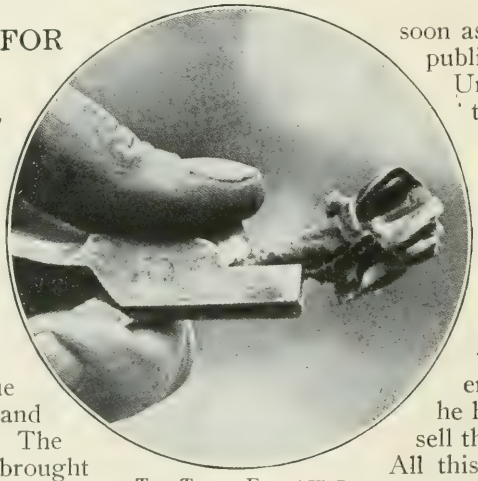
A CHICAGO man who recently had to build on a spot occupied by a large tree, decided to erect his building around the tree and by so doing saved his tree and gained a real up-to-date roof garden where he could enjoy the cool breeze and entertain his family and friends.

A PERILOUS JOB FOR THE DENTIST.
Extracting the aching molar of the lion "Brutus" at a London pleasure park. As will be noted, "Brutus" is bound with ropes.

HAYTI'S NAVY FOR SALE

ADMIRAL WATTS, a Brooklynite who enlisted in the Haytian navy and was made admiral and placed in command of the entire fleet, consisting of one ship, recently had this vessel at the League Island Navy Yard and wanted to sell it. The Haytian "navy" was brought to the League Island yard for some much needed repairs. Private shipbuilders said it would cost $30,000 to make these. The United States government was then appealed to and after some figuring it was found that the "navy" could be made seaworthy for about $18,000.

The new government at Hayti arranged for the repairs and matters were left so that as soon as the West Indian republic signed a contract, Uncle Sam would start the work. Time went on and the required papers were not forthcoming. Idleness did not improve the vessel. Then the crew deserted and the Admiral had to resort to shad fishing to get enough to eat. Now he has been authorized to sell the navy as junk.



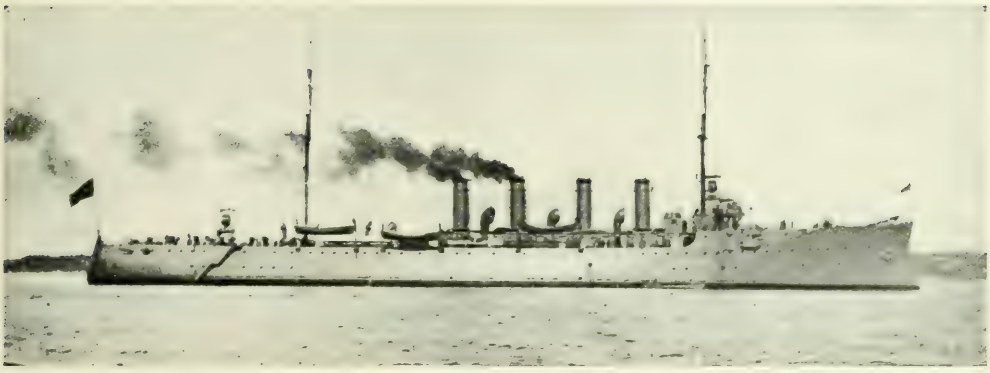
THE TOOTH EXTRACTED.

All this the Admiral told as he walked the dirty deck of his warship.

"And say," he added, "if you hear of any one who wants to exchange anything useful for an Admiral's full dress uniform let me know, will you?"

So it is evident that the title "Admiral" does not necessarily always carry with it great honors, dignity and power, as is commonly believed.

THE HAYTIAN "NAVY."



THE U. S. CRUISER *CHESTER*, WHICH WAS SENT INTO NORTHERN WATERS IN AN ATTEMPT TO DESTROY ICE-BERGS BY CANNONADING.

BATTLESHIP CANNOT DAMAGE ICE-BERGS

THE United States cruiser *Chester* recently returned from the ice-berg zone, whither she had been sent by the government, following the *Titanic* disaster, for the purpose of ascertaining whether it would be practicable for a fleet of war-ships to bombard a fleet of ice-bergs to destroy them. The *Chester's* officers gave the idea a fair test, about ten or twelve miles north of the *Titanic's* grave, but found that the heavy cannonading of the war vessel has little or no effect upon the huge mountains of ice. Even to the smallest bergs little damage could be done.

Four monster bergs were sighted and the battleship was laid to within a few hundred yards, as close as it could safely approach them, and two rounds were fired into one of them from the three-inch guns. A few splinters and chunks of ice were knocked loose, but, when the boats were lowered and drew up near the berg, it was found that the damage done was scarcely noticeable. The sailors, however, were glad to pick up the floating chunks that had been knocked off, for it gave them their first drink of really fresh water for many days.

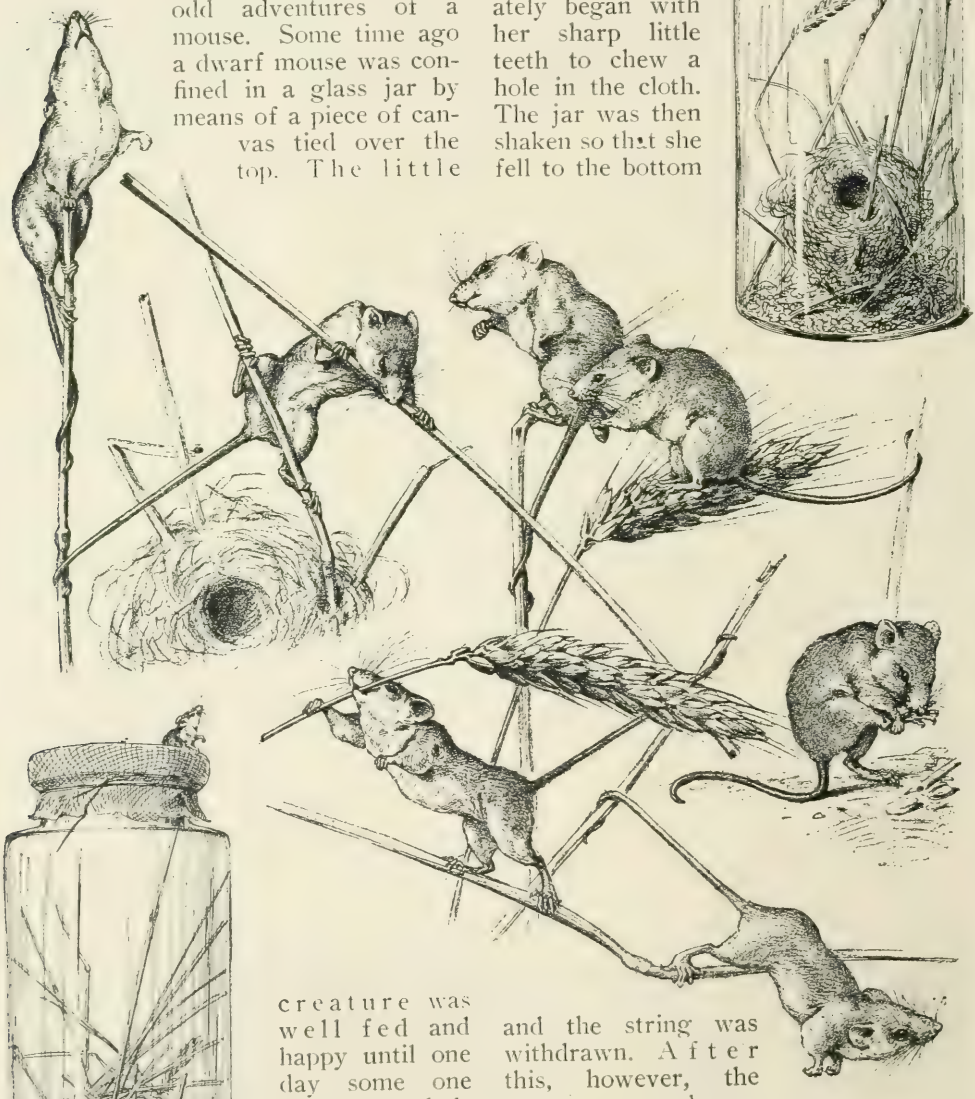
It would, indeed, seem almost as feasible to attempt to destroy a cliff of solid granite rock as it would an iceberg, by cannonading. Ice-bergs float with about one-eighth of their mass above the water. Inasmuch as some have been known to rise from the waves to a height of two to three hundred feet, the helplessness of man with all his engines of destruction, when arrayed against one of these monsters, is quite evident.

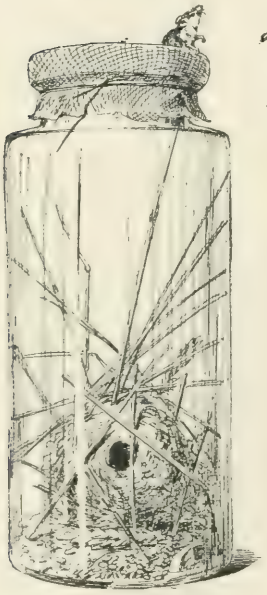
AN ICEBERG HIT BY A THREE-INCH SHELL.

THE DWARF MOUSE, THE JAR AND THE STRAW

THE desire of liberty sometimes develops in imprisoned animals new instincts which result in their employment of remarkably clever strategems.

An unusual story is told in La Nature of the odd adventures of a mouse. Some time ago a dwarf mouse was confined in a glass jar by means of a piece of canvas tied over the top. The little creature was well fed and happy until one day some one through a hole in the canvas let down a bit of twine as far as the straws shown in one of the illustrations. This animal, which is endowed with great agility, instantly climbed up the straw, caught hold of the string, pulled herself up to the canvas, and immediately began with her sharp little teeth to chew a hole in the cloth. The jar was then shaken so that she fell to the bottom and the string was withdrawn. After this, however, the mouse was no longer at ease, but was constantly climbing up the straws as if looking for the string. Some heads of wheat were now put in the jar in order to amuse her, and she gave herself up to gormandizing until these were consumed. Then she was observed



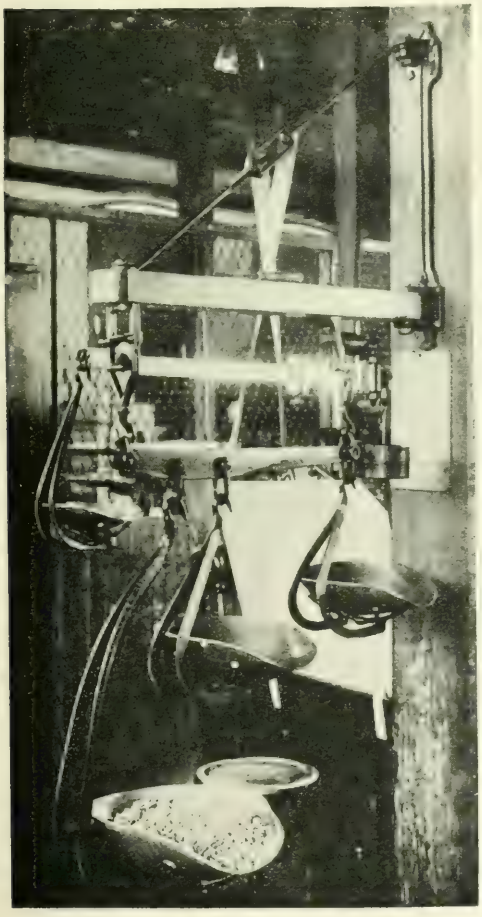


to be carrying the longest straw and fixing it upright against the side of the jar. In this way she made a ladder, and one morning she was found to have escaped and to be running about the house. With some difficulty she was captured and put back, whereupon she hid herself as if in shame in the bunch of straw.

SCALES THAT COUNT

SUPPOSE you had to count ten thousand screws about the size of a common carpet tack. It would probably take you the best part of a day, and if you had to do the same thing every day the time you would spend would amount to considerable in the course of a year with comparatively little accomplished.

Realizing this fact an Eastern manufacturer of automobile horns has devised a system of counting small parts by weight and the scales shown in the illustration accomplish this task in an interesting manner.



SCALES THAT COUNT.

OLDEST EX-CHIEF OF POLICE IN THE WORLD.

For Miguel Soberanes—at left—of San Diego, California, is claimed the honor of being the oldest ex-police official in the world. There will be few to dispute Soberanes' claim, for he is 101 years old.

As it will be noticed there are four scoops upon the scales. The upper, or smallest, scoop is known as the unit and any one part placed in it is balanced by twenty-five, fifty, or one hundred times its weight in the lower scoops in consecutive order. Thus if it is desired to count one thousand screws, ten are placed in the unit scoop and the lower scoop filled until the scales balance.

Any other required number may also be attained by multiplying the number of units in the small scoop by twenty-five, fifty, or one hundred. The scales can also be operated in the opposite manner, if desired, if a small number of parts are wanted in a case when the contents of the larger scoop are known. In this manner small parts are easily and quickly handled with a considerable saving of time and patience for the stockkeeper.

HYDRO-ELECTRIC POWER STATION NEAR NITROLEE, SOUTH CAROLINA, THAT FURNISHES

FERTILIZER FROM THE AIR

By

T. P. NASH

TRANSMUTATION of air into fertilizer, the erstwhile mad dream of the twentieth century alchemist, is now an accomplished daily miracle at Nitrolee, South Carolina. Here every twenty-four hours the magic of modern science, working with the "base" elements of the atmosphere in their commercially valueless state, turns in a cycle of profit as golden as the process by which the first alchemist sought to change lead into silver. The modern alchemist has discovered his Philosopher's Stone in the electric current; his base elements are the nitrogen of the atmosphere—which for all its active good might as well be in the sun—and the limestone weathering in the hills; and the golden product of his art is nitrate of lime, one of the most valuable of the essential fertilizers.

"Fertilization is our greatest problem," said one of the builders in the New South, whose master mind has chained the water power of a great section and directed its energy along thousands of miles of wires to turn the wheels of manufacturing plants in two great States, to light their cities, to drive an inter-state railway, and, last of all, to solve the problem he considers greatest—that of fertilization.

Where a surfeit of undeveloped land is always just beyond the border of cultivation, there is no thought of fertilization. The problem is more simple. It is but the laying aside of that which has been robbed of its fertility, the clearing away of a fresh portion of the forest, and

ELECTRIC CURRENT EMPLOYED IN THE FERTILIZER-FROM-AIR PROCESS.

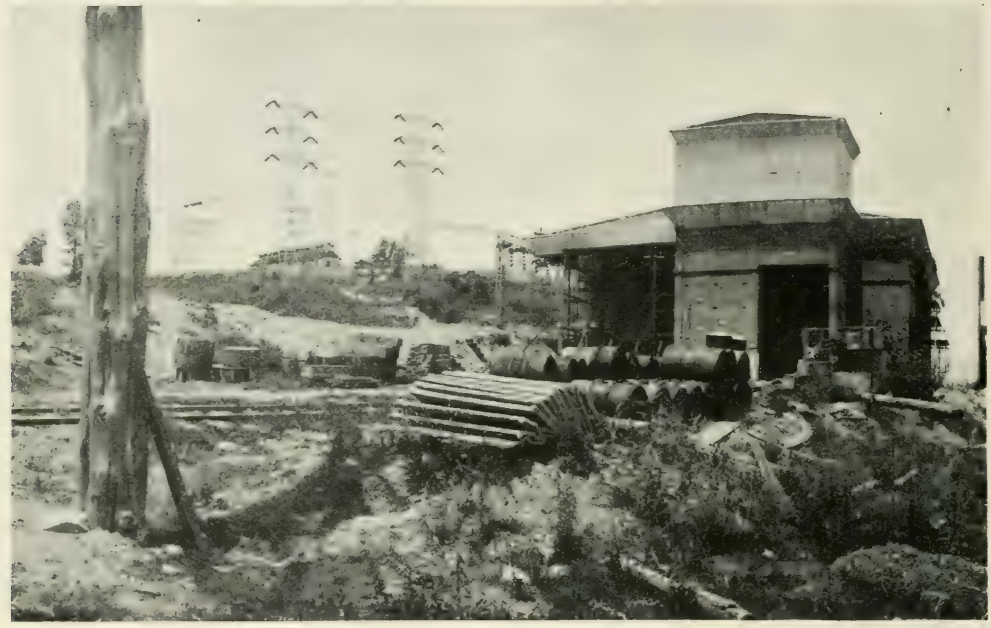
the moving on to virgin soil. So, for many a year the South shipped away its millions of bales of cotton to Europe without a thought of how the matter so removed from the soil might be returned. So it may well be for many a year with the thousands of rich acres the government is reclaiming from the blight of drought in the West with mighty irrigation projects. Virgin soil is supplied with a surplus of plant food that will support crops for an untested period. But the time must come on the new acres of the West as it has already come on the old acres of the South when failing crops force home the simple logic of an overdrawn account, and the vital necessity of supplying to the soil in corresponding degree the elements which are removed from it in vegetable growth.

The business of artificial fertilization of farm lands is comparatively young. Not until agricultural chemistry analyzed soils and the plants they produced, and pointed out the definite chemical elements involved in the transfer from soil to plant, was artificial fertilization conceivable on any scale of consistency or practicability.

In the present refined state of the fertilizer business fertilizers are prepared of varying composition in recognition of the fact that different crops require different elements and all lands do not require the same treatment. Certain well defined chemical elements or primary substances, limited in number, are recognized as essential fertilizing agents, however, and by far the most common and important is the element nitrogen which in its uncombined state exists in the atmosphere as an odorless, tasteless, invisible gas.

If the chief problem of agriculture is fertilization, the greatest problem of fertilization, therefore, is the supply of nitrogen. With nitrogen composing approximately four-fifths the atmosphere, and the supply of atmosphere practically unlimited, the problem at first thought appears no problem at all. But nitrogen in its uncombined state as it exists in the atmosphere is not assimilable by plants and has not part in their growth. So we find that compounds of nitrogen, that is, mineral bodies in which nitrogen is in combination with other chemical elements, furnish the chief source of fertilizers.

Compounds of nitrogen are derived from three main sources: The first of these is the so-called Peruvian guano—



GREAT FALLS STATION OF THE POWER COMPANY THAT

excrement of sea birds and reptiles and fossilized animal matter, accumulated through long ages in Peru. Fifty thousand tons annually were derived from this source in the middle of the nineteenth century, but today the supply is practically exhausted. The second is ammonium sulphate, produced in considerable quantity as a bi-product in the distillation of coal tar in gas plants. Ten years ago some 500,000 tons were derived yearly from this source, and represented a value of about $20,000,000. The third, and by far the most important source of nitrogen compounds, is the nitrate of soda, or Chili salt petre so-called, derived from a rainless district between the Andes Mountains and the coast hills, a narrow strip of land where for countless ages the accumulation of this substance has been going on. About 68,000 tons of Chili salt petre were imported in 1860; in 1900 importations from this source had increased to 1,453,000 tons.

One other indirect source there is in which the nitrogen of the atmosphere is stored in the soil. This is accomplished by certain plants, as clover, beans, and peas, which have on the roots little nodules that serve as nitrifying agents. As a source of fertilization, however, this method is so slow in operation and so limited in application as to be absolutely negligible here.

The most serious aspect of the problem of fertilization is that it continually grows larger. Each year sees an enormous increase in the business of manufacturing commercial fertilizers. It has been calculated that the supply of Chili salt petre will be completely exhausted within the next fifteen or twenty years. After that—What?

Under pressure of necessity European scientists undertook to answer the question. The atmosphere was their point of attack. Here was nitrogen in inexhaustible supply, but in a state not available for plant food. The problem was to make the nitrogen in the atmosphere available.

Nitrogen at ordinary temperatures is a peculiarly inactive, inert gas. The only

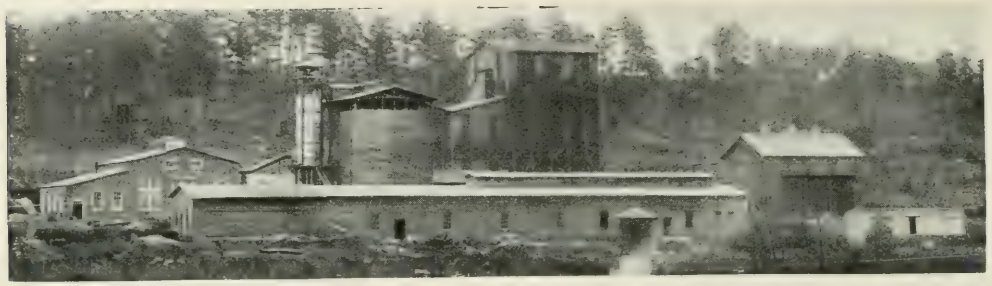
HAS UNDERTAKEN TO MANUFACTURE FERTILIZER.

function hitherto attributed to it is the dilution of the oxygen which constitutes the other main element of the atmosphere, to the proper strength for animal consumption. The two elements exist in the most intimate physical mixture without the slightest apparent chemical affinity. Could chemical combination be effected between the two, the end of the problem would be in sight.

A well-known chemical phenomenon is the tendency of most elements which are inactive at normal temperatures to become active at extremely high temperatures. A lightning flash may have suggested the agent for producing the high temperature. And the rest was easy.

The essential character of the process devised by these scientists of Europe, and for several years successfully applied commercially, is energizing the inert nitrogen by means of the electric arc. The details of the process are easily understood even by those not familiar with chemical terms and reactions. A strong current of air is forced by a powerful blower into a small chamber containing carbon electrodes. The air current here plays against an electric arc between the electrodes, which, on account of the excessively high voltage employed, is several feet long. In the intense heat of the electric arc, a heat which is frequently as high as thirty-five hundred degrees centigrade, a small proportion of the nitrogen and oxygen present combine to form oxides of nitrogen. The contact with the arc is but momentary; the current sweeps air and oxides on through a series of absorption tanks, and finally through an absorption tower similar to that employed in the manufacture of sulphuric acid. The nitrogen oxides dissolve in the water forming nitric acid, the air bubbling through and escaping. The further stages of the process are concerned simply with the concentration of the acid, either by further absorption or evaporation by heat; and treating the liquid acid with ordinary limestone, nitrate of lime resulting from the chemical reaction that ensues.

The successful commercial operation of this process differing only in detail of



BUILDINGS AT NITROLEE, WHERE, BY MEANS OF THE CURRENT FURNISHED BY THE HYDRO-ELECTRIC POWER STATIONS, THE NITROGEN OF THE ATMOSPHERE IS OXIDIZED, DISSOLVED IN WATER TO FORM NITRIC ACID, AND FINALLY TREATED WITH LIMESTONE, THE PRODUCT BEING A NITRATE-BEARING FERTILIZER OF HIGH GRADE.

local application, has been demonstrated within the past several weeks at the plant located at Nitrolee, South Carolina. The plant is now being operated on a regular twenty-four hour schedule with plans in progress for enlarging the plant to five or six times its present capacity.

The most serious drawback to the commercial success of the process is the tremendous disproportion between the amount of electrical energy employed, and the amount of acid fertilizer procured. It is only where the electric power is much cheaper than can be furnished by steam generation that the process is applicable. Hence the process is carried on only where the source of electrical energy is water power, and only then where there is more power than can be disposed of in other fashion.

The conditions at Nitrolee which have made an experiment with this process desirable are: First, a surplus of power at hand from the plant of the local power company; and, second, a fortunate supply of limestone in the neighboring hills.

The plant owes its conception to the desirability of utilizing the variable surplus, and until recently the waste horsepower of the Great Falls and Rocky Creek hydro-electric stations. These power stations have a generating capacity of eighty thousand electric horsepower. The actual amount of horsepower generated, however, is a variable depending upon the seasons, which influence the fall of water, and other factors. On this account the maximum of power which can be contracted for by the power company to be furnished regularly is far below the rated capacity of the stations. Furthermore the demands made upon the contracted power vary between wide limits for the day and night periods, so that there may be a recurring surplus even in the contracted power. These considerations led to the provision of a consumer of the surplus power, both daily and seasonal.

The plant at Nitrolee is admittedly an experiment. Only four thousand electric horse power daily can be utilized by the Nitrolee plant, representing an output of five tons nitric acid daily; or in terms of nitrate of lime which is the finished product—the available chemical form in which the essential nitrogen is fed to the plants—about eight tons. A second plant is now proposed with a capacity of twenty thousand horsepower daily.

Every part of the machinery employed in the plant, from the immense "blower" to the brick used in the construction of the absorption tower, had to be imported from Europe. There are no establishments in this country capable of turning out the articles desired. For example, no brick of American manufacture could be found of the right quality to withstand the vitriolic effects of the nitric acid.

A LIVE HEAD FILIPINO STATUE

THIS picture appears to be of a marble-white statue with a very dark face and head; and in truth it is. An American was taking snap-shots of the interesting things in Manila, when he came upon a headless statue in one of the parks of the island city. The inscription at the base of the monument indicated that the statue was, or had been, erected in honor

STATUE CAPPED BY LIVE HUMAN HEAD.

of a famous Spanish leader. But the head had been broken off during the war, either with Spain or America. The statue would have been photographed in its headless state but for the kindly assistance of a Filipino who happened to pass just as the camera was set. The native, both in a spirit of kindness and fun, threw off his broad-brimmed hat—which may be seen hanging on the iron pickets of the fence in the foreground—and mounting the statue, placed himself behind it in such manner as to supply the missing head.

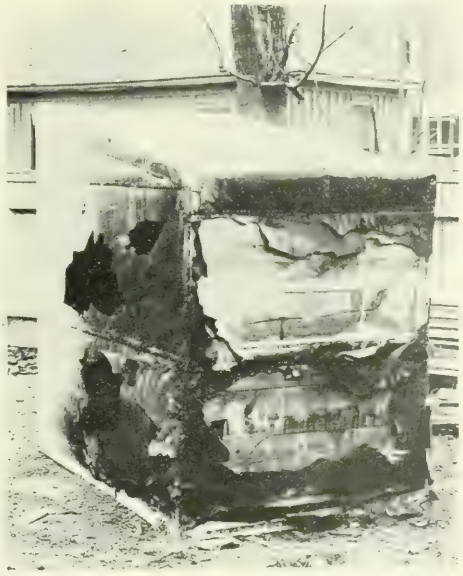
It is a little dark, but the proportions are very good.

ASBESTOS ROOFING FIRE TEST

AN asbestos roofing fire test that excited much interest among builders was made not long ago at Houston, Texas. The demonstrators of the roofing material erected a small cabin of wood and covered it with asbestos roofing. The building was exposed to an intense fire for one hour and it came out of the furnace intact. The roofing material was removed from portions of the house and sheathing boards, which were thus exposed, were shown to be not even scorched. The only effect of the fire upon the boards was black splotches caused by melting of asphalt with which the asbestos fiber was mixed. It is claimed that asbestos roofing can be applied to large buildings as well as residences, and that it never requires any coating or paint.

HATCHING QUAIL IN AN INCUBATOR

GROWING quail for profit might become an important industry in Kansas, if the game laws did not prohibit the sale of the birds. Someone in that state sent the Agricultural College ten quail eggs. These eggs were placed in an incubator, along with a partridge cochin egg, which was used as a check. The temperature, ventilation and moisture were regulated the same as if the eggs were all chicken eggs. At the end of twenty-one days, nine of the quail eggs and the cochin egg hatched. Quail are remarkably small when young, as the picture will show. Of course, the cochin



ASBESTOS ROOFING FIRE TEST.

is rather a large chicken, which makes the quail appear relatively smaller.

The quail seemed to require different and better care than did the chick. At any rate, seven of the nine quail died, although they had the best care that an experienced poultry man could give them. They might have done better if they had been given to a hen. They were kept on land that had been used for chicken-growing and may have died from some chicken disease that would not have killed small chicks. Probably the best way to grow these quail would be to turn them loose in some woods, free from chicken diseases.

Young Quail Compared with Cochin Chick.

These quail will be turned loose when they are large enough to take care of themselves. It might be possible to stock the country with quail by the use of incubators and, thereby, make it possible to have enough of these birds to allow the sale of them. As it is now, many of the young quail are killed, before they reach maturity, by dogs, coyotes and vermin.

SEALING BY ELECTRICITY

ANYONE familiar with the method of sealing packages in banks and express offices will at once appreciate the usefulness and superiority of the electrical sealing device shown in the illustration, over the old-fashioned process.

The electrical wax melter and dropper is one of the latest productions in the line of office convenience. It consists of a melting pot for holding the wax attached to an electrical heating device containing some resistance material through which the electric current passes, causing it to become heated and to melt the wax. A handle is attached to the side of the melting pot for the convenience of the operator in moving the sealer about and a trigger underneath the handle opens, at the will of the operator, a valve in the bottom of the melting pot, allowing just enough melted wax to run out upon a package to seal it properly.

Sealing a Package by Means of Electricity.

The stamp or seal can then be applied with the other hand of the operator. The advantages claimed for the electric wax melter are the convenience of handling the work and the ease and rapidity with which packages can be sealed. There is no smoking or burning of the wax as with a flame, the wax is not smeared over the package, but one large drop is placed just where it is wanted and, after cooling, the seal is clean and glossy.

Bulk wax, which is cheaper than the usual sticks, can be used in the melter, and all scraps can be replaced in the melter and used again, thus effecting considerable economy.

WORLD'S SHIPPING LOSSES

IN the summary of vessels totally lost, broken up, condemned, etc., Lloyd's Register shows that in 1911 the gross reduction through wreckage of effective mercantile marine tonnage of the world was 888 vessels of 884,843 tons, omitting all vessels of less than 100 tons. In this total 427 vessels of 619,752 tons were steamers, and 461 of 265,091 tons were sailing vessels. In 1910 the wreckage aggregated 62,847 tons more than in 1911, the excess in loss of steam vessels being 47,688 tons, and sailing vessels 15,159 tons.

CLASS RECEIVING INSTRUCTION IN GENERAL CLERICAL WORK.

HELPING THE RAILROAD MAN

By

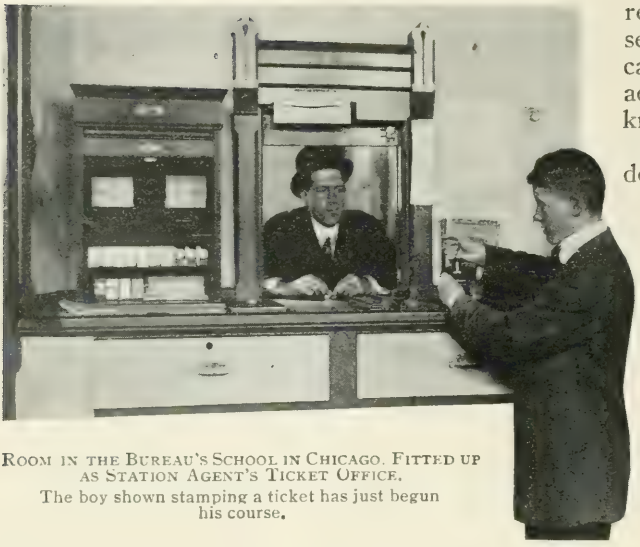
R. H. MORTON

THERE are in the United States some 365 railroad companies, with approximately 1,755,000 employes. How to be of the greatest service to this vast army of men, how best to safeguard their interests, further their progress and increase their fitness for railroad work are questions which the officials of most of these companies have constantly before them. This is justifiable, for the human element is by far the most important cog that enters into the machinery of a great railroad system. That it is also one of the most expensive is indicated by the fact that last year the compensation of all railroad employes in this country reached the enormous total of $1,172,181,000.

A few years ago officials of the Union Pacific Railroad, in looking about for men to fill several of the advanced positions, deplored the fact that it was necessary for them to go outside of their ranks to find suitable material. This was a condition that seemed entirely wrong to them, and they began to question why it should be so. The answer was that while in the majority of cases a railroad employe may be familiar enough with the specific duties of his position, his usefulness in some other branch of railroad work is practically nil. The average brakeman, for instance, knows nothing about the complicated machinery of a locomotive; the trackwalker is unfamiliar with the work of the man who sits up in the signal tower; the section hand is ignorant of the station agent's duties, and so on. The only way any employe can learn about these things, if he is ambitious to improve his condition, is to take a course in some school where railroad subjects are taught. This plan, however, has the disadvantage of costing the employe more than he can afford.

Realizing this, the Union Pacific decided to establish a school, or educational bureau, of its own, through which any one in its employ could, without incurring any personal expense, avail himself of the benefits of some thirty courses of instruction, covering practically every branch of railroad work. They were followed in this move a little later by the Illinois Central and the Central of Georgia. Today the three roads are cooperating in the work, having established a central bureau, with offices at Omaha, Nebraska. The bureau is under the direction of Mr. D. C. Buell, who has a dozen or more assistants, including traveling representatives, instructors, etc.

The whole sum of the educational bu-



ROOM IN THE BUREAU'S SCHOOL IN CHICAGO. FITTED UP AS STATION AGENT'S TICKET OFFICE.
The boy shown stamping a ticket has just begun his course.

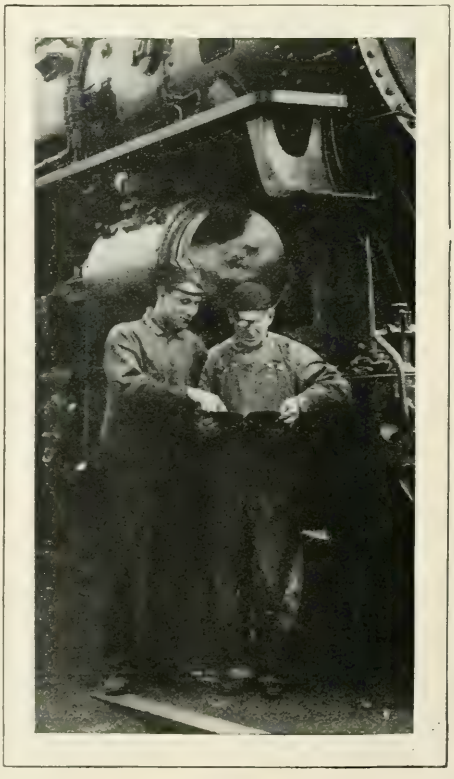
reau, according to Mr. Buell, is, that the railroads are creating a reserve supply of better men; are offering each employe an equal opportunity to become better informed relative to his particular duties, or railroad work in general, in order that he may increase his capacity to assume greater responsibilities—to fit himself for promotion. That the employes themselves are keenly interested is shown by the fact that more than ten per cent of the men on each road are now enrolled as students.

Instruction is conducted by correspondence, so that each employe no matter where located will have an equal opportunity to obtain the benefits offered. The methods of the best correspondence schools have been studied and altered, where necessary, to fit the particular purpose in view. The lesson papers are specially prepared for this work and are approved by the heads of the departments interested before they are issued. In this way whatever a man studies can be taken as official authoritative information which may be put to immediate practical use.

A pamphlet entitled "How to Study" is sent with the first lesson papers and fully explains how to proceed with the studies. Each lesson contains a set of examination questions which a student must answer in order to qualify on that lesson and proceed with his studies. The answers are corrected in the office of the bureau, and the corrected papers sent to the student so that he can ascertain whether he has acquired an understanding knowledge of the subject.

Lack of previous education does not prevent the taking of a course. Some of the courses can be completed by anyone who can read and write; while others require a knowledge of addition, subtraction, multiplication, and division. Writing, spelling, grammar, and punctuation are not considered in correcting the lessons.

When a student is unable to handle a problem in his lessons, an effort is made to explain to him by correspondence or by diagram how it should be worked out. But if after receiving an



FIREMAN AND ENGINEER WORKING TOGETHER ON LESSONS WHILE WAITING FOR TRAIN TO BE MADE UP.

explanation of this kind the subject is still unintelligible to him, then the bureau's traveling representative takes his name and address and makes it a point to call on him and clear up the difficulty.

In addition to this, the bureau has put

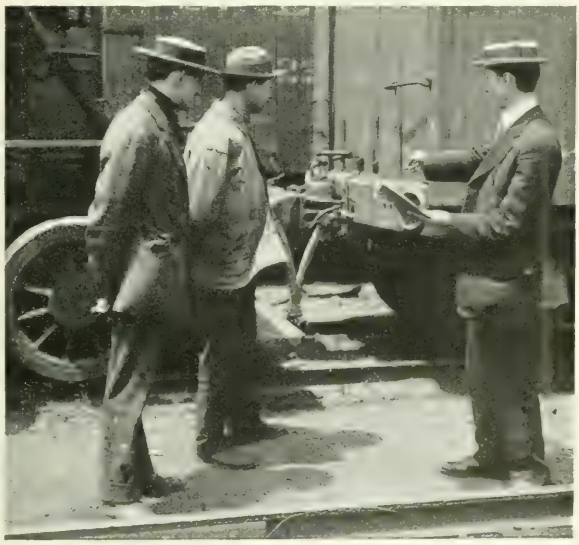
D. C. Buell, Chief of the Railroad Educational Bureau.

into operation a series of lectures and talks at division and district terminals, illustrated by means of lantern slides and moving pictures. It is believed that the moving pictures will be of especial value in illustrating many of the operations of railroading, such as locomotive firing, shop practices, and general road work.

There are in the neighborhood of six hundred publications, or units, that go to make up the educational bureau courses. With each unit goes a record sheet on which the student inserts the data regarding the sending of his lessons to the bureau, their return to him by the bureau, the percentage obtained on each lesson, and his average percentage in his studies, together with such information as will assist him in having on hand a record of his work with the bureau.

Another important part of the educational bureau work has to do with the training of station helpers and clerks. A class room has been fitted up in Chicago, where young men are received from telegraph schools, after having passed an examination as to their ability to meet certain educational and physical requirements, and are given a practical course in station and other clerical work. This class room is equipped with the regular local station furniture and forms; wires are cut into an operator's table; and tariffs, tickets, baggage checks, time cards, etc., are used to familiarize the students with the actual work they will have to do when they go into the service. Between forty and fifty students are regularly in attendance, the time required to complete the course averaging about four weeks. On graduation the student is placed in a position as station agent's helper. After three months of acceptable service to the agent under whom he has been placed, he is promoted, when qualified to pass the required examinations, to the position of scheduled telegrapher. From then on promotion depends entirely upon his ability and his attention to duty.

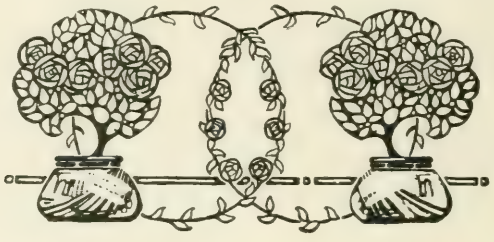
The success of this feature of the bureau's work is due in large measure to the efficient methods of instruction carried on by Mr. E. A. Barton, head of the school, under the direction of the bureau. Mr. Barton is exceptionally well qualified



A Trainmaster Giving a Lesson.
He is explaining the right and the wrong way of coupling cars, as outlined in one of the instruction papers.

for the work; he has spent many years in the service of the Illinois Central, and has the faculty of interesting the students in station work to a very marked degree. Not only have graduates of this school, almost without exception, made good in their positions as helpers and clerks, but many of them have very promptly been promoted to places of increased importance and responsibility.

Going one step farther, the educational bureau has made plans to assist employes in legal matters, in so far as is possible. It issues from time to time pamphlets for general distribution, dealing with matters wherein experience has proved that, for want of legal aid, employes have been imposed upon so that they have suffered either financial loss or worry and unpleasantness which could have been avoided had they known their legal rights. The object in offering free legal aid is a purely friendly one. The railroads feel that if they assist any of their employes in this manner they will be well repaid in better and more loyal service.



Why may not a goose say thus: "All the parts of the universe I have an interest in: the earth serves me to walk upon, the sun to light me; the stars have their influence upon me; I have such an advantage by the winds and such by the waters; there is nothing that yon heavenly roof looks upon so favorably as me. I am the darling of Nature! Is it not man that keeps and serves me?"

—*Montaigne.*

AUTOMATIC POULTRY FEEDER

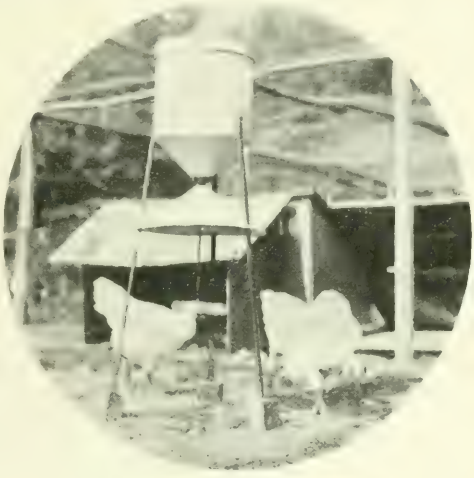
THE photograph accompanying shows a newly invented type of automatic poultry feeder. Its working depends upon the same principle that is used in baiting a trap, for this feeder has a bait that is pecked by the hungry fowls and in response the machine lets a shower of grain fall on the ground, which they devour.

The machine consists of a galvanized iron supply fount filled with grain and a revolving toothed wheel at the base of it. This wheel is mounted on very delicate bearings which admit of its movement at the slightest touch. Attached to the wheel is a shaft which supports the bait. The "bait" consists of a hollow tube of wire-netting containing wheat. The fowls see the wheat through the netting and peck at it, causing the toothed wheel to revolve and throw out grain, which is thrown on the lower metal cone and scattered over the ground almost as efficiently as by hand. This prevents the fowls from gorging themselves, as they always will if food is too plentiful.

It is interesting to watch the fowls after the feeder is in use for a time, for there is no great rush to peck the bait as one would imagine. The other fowls, the "wise" ones, wait around in a circle where the grain will be thrown. The unsophisticated one that pecks the grain usually gets very little of it for his efforts.

AIR FROM THE GROUND

AT Luray, Page County, Virginia, are located some of the most beautiful caves in the world; extending for some three miles, these caverns honey-comb



AUTOMATIC POULTRY FEEDER.

the eminence known as Cave Hill. In the same town is the residence of Mr. T. C. Northcott, a retired heating and ventilating engineer, who has acquired the caverns.

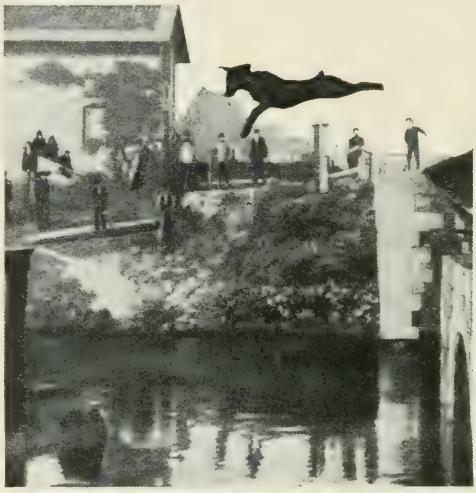
Ordinarily the possession of a limestone cave, no matter how beautiful, would seem to have little to do with science and health. But cave air is practically germless, as well as of uniform temperature; it is also as dry as air may

THRILLING RESCUE FROM A BURNING SHIP.

The photo shows the life boat returning from the ship *Canada Cape*, which is seen well ablaze, in Table Bay, Cape Town, South Africa. The life boat rendered signal service to the imperilled crew.

be which is constantly circulating over limestone.

Combining the above factors, Mr. Northcott piped the air from the caverns into his home by means of a huge air-duct and suction fans; in short, getting his ventilating, and to a certain extent his heating, absolutely free! It is hard to imagine a more complete harnessing of nature to the service of any one man. In the first place, he is placed in touch with an abundant supply of fresh, dry, germless air at a constant temperature of between fifty-four degrees and fifty-six degrees. If the statements of scientists are true, then in escaping the onslaughts of germs Mr. Northcott should live to a ripe old age. Recognizing this fact, Mr. Northcott never opens the windows of his house, except for cleaning purposes, with the result that catarrh and colds are unknown. The quality of the air is such that the claim is made that a day or two in this house will cure the most obstinate case of la grippe.



Dog Making a Remarkable Leap.

Furthermore, since this air comes into the house at an average temperature of fifty-five degrees the year round, heating in winter and cooling in summer are results attained with the minimum of effort and expense. Mr. Northcott has arranged heating coils outside of the house, so that he avoids the contamination due to the fumes of combustion; since it is only necessary to raise the natural temperature of the air some ten degrees for comfort, it is easily seen that the necessary heating may be accomplished much more economically than would be possible under normal conditions, where an increase of thirty or forty degrees would be necessary. Incidentally, outside air varies in temperature and humidity, whereas that of the caverns does not. Result: No hurried trips to put the drafts on the furnace or to dampen it off to meet a sudden change in the weather.

So much for the winter. We are willing to admit that it is easier to keep warm in winter than cool in summer, so once again Mr. Northcott has the advantage. He admits the unwarmed air into his house, and the temperature drops to a coolness which would make a log fire welcome, no matter how the mercury soars outside. The simplicity of the whole arrangement should excite the admiration of the engineer; it will certainly stir the envy of ordinary mortals. If there were only enough such caves in the world for all of us!

WONDERFUL DOG JUMPERS

ANIMALS have accomplished remarkable feats, both in running and jumping, but few dogs can boast of a better record than that held by the little animal shown in the illustration. The dog, a Belgian shepherd, is in the act of making a leap of about 21 feet, which is considered a most remarkable record by all judges of this class of sport. It gives some idea of the courage displayed by this breed of dogs in undertaking dangerous leaps.

The dog is the property of a resident of Liene, Belgium, who makes a business of training these animals in the art of hazardous performances. The record made by this dog is not considered by its owner as the most remarkable record established by his pupils, as he has other dogs which have been known to make leaps of from 22 to 24 feet.

It has always been generally supposed that the Russian greyhounds are by far the best jumpers the world has produced,

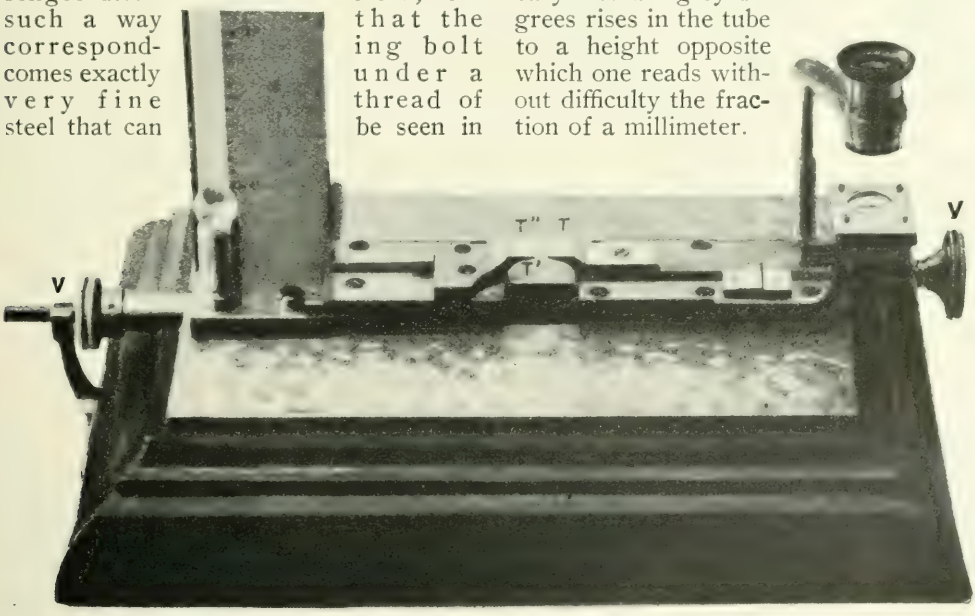
but the records established by these Belgian dogs recently make these Russian dogs look to their laurels.

The chief requisite in making a successful jumper out of a dog is that it should have a body that is not too corpulent, and it is for this reason that the Belgian dogs are particularly well adapted to training of this nature. The dogs are in all cases shepherd dogs, receiving plenty of exercise and not being in a position to be overfed as is the case with a great many city dogs.

A NEW MICROMETER

THE photograph shows a new micrometer which is used by a Swiss watch company for measuring parts of a watch the fiftieth or the hundredth of a millimeter in size. In using this apparatus, the object to be measured is placed between the keys T and T. The action of the micrometric screw determines, first, the round number of millimeters for the reading of the millimetric graduation, which is displayed opposite as an index mounted on the firm part of the base. The object to be measured is then slipped between the keys T and T. The screw V holds a drum on which is traced one single division, in such a way that the corresponding bolt comes exactly under a very fine thread of steel that can be seen in the photograph, under the loop, when the index in question is opposite a division of the millimetric horizontal graduation mentioned above. It is evident that after this first operation, if the object does not measure an accurate number of millimeters, the division of the V drum will not be found under the steel thread. To bring it there, it will be necessary to turn the screw V to an exactly corresponding fraction of a millimeter of which the object exceeds the round number already obtained. But in this displacement, the object pushes back the movable key T which commands the mercury piston. The mercury, which touches the zero of the graduation, rises in the graduated tube to a height opposite which one reads without difficulty the fraction of a millimeter which is sought.

There are few industries that require so much the use of micrometric machines as watchmaking, where some of the parts measure the fiftieth or the hundredth of a millimeter in size, and the slightest error cannot be allowed. Consequently it is necessary to use proper instruments in order to avoid errors. Machines for reading directly by means of lenses present some practical difficulties. A Swiss watch company is now employing a mercury micrometer. The column of mercury increasing by degrees rises in the tube to a height opposite which one reads without difficulty the fraction of a millimeter.

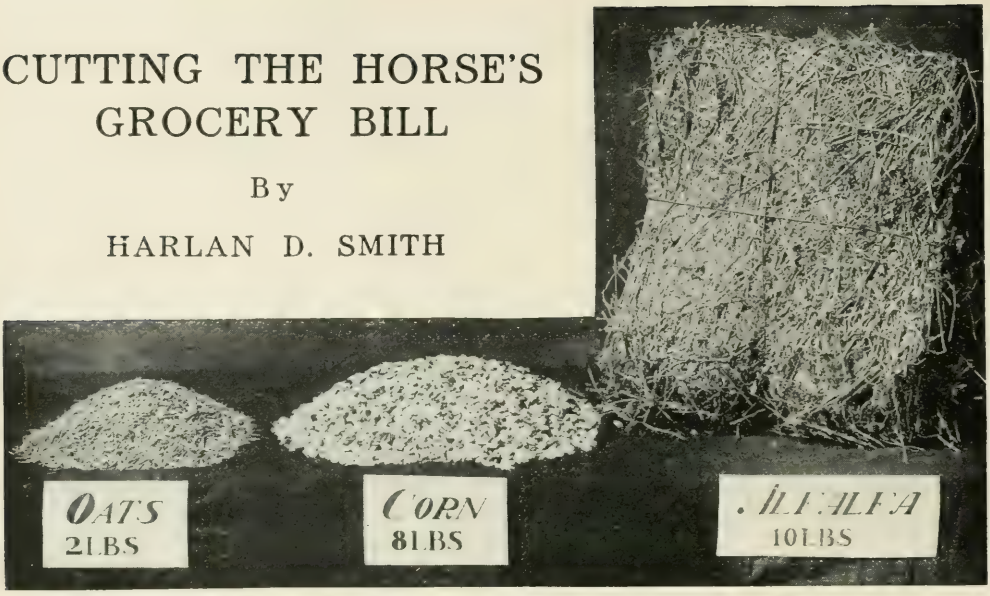


NEW MICROMETER THAT MAKES EXCEPTIONALLY DELICATE MEASUREMENTS.

CUTTING THE HORSE'S GROCERY BILL

By

HARLAN D. SMITH



THIS RATION, AS FED TO HORSES IN PLACE OF THE ORDINARY ONE, PROVED BUT ONE-THIRD AS COSTLY.

AN uppercut has been struck at the high cost of living for horses. Kansas experimenters have found a ration for work animals that is just as good as oats and timothy hay—the old standard feed—and it's one-third cheaper. It's a balanced ration of corn and alfalfa hay, with a very little oats thrown in as a relish. Every man who feeds one of the 20,509,000 horses which officially exist in this country now will appreciate this discovery. And, by the way, we're not such a motor-crazy country after all, are we? Gained 232,000 horses last year. Which is pretty convincing evidence that the horse isn't "passing" just yet. And of course this growing horse census makes feed more expensive every year. Baled timothy hay sold in Chicago ten years ago for $10 to $17.50 a ton, wholesale. Last year the range was from $15 to $25 a ton at the same market.

To find a cheaper feed for horses was the aim of a gigantic test recently completed, with the result noted, by the Kansas Agricultural College co-operating with the United States government. Nine hundred government horses were divided into seventeen lots and fed as many rations for 140 days. They were artillery horses stationed at Fort Riley. The test was planned by Prof. R. J. Kinzer, formerly head of the department of animal husbandry at the college. Dr. C. W. McCampbell, of Professor Kinzer's department, managed the details. It probably was the largest horse feeding experiment ever conducted, and the results obtained are thought to be most conclusive and dependable.

The biggest gain of the experiment—25.6 pounds a head in 140 days—was made by the lot which ate the prize

BEING AN ARTILLERY
For that reason the results obtained in feeding tests at Fort

ration—eight pounds of corn, two of oats, and ten of alfalfa hay. And this gain was made on ten pounds of grain instead of twelve as fed to the other lots, and ten pounds of hay instead of fourteen when timothy and prairie hay were used. Furthermore—and this is the real point—this ration cost only thirteen cents daily, compared with eighteen to twenty cents for the other rations used. The cost of a daily ration for a horse is computed on the basis of a one thousand-pound animal.

Every one of those nine hundred animals had its breakfast, dinner, and supper weighed exactly to the ounce and recorded, every one of those 140 days. And they got their meals right on the dot, too. Soldiers, under military discipline, did all the work of feeding and grooming. Officers had strict orders to see that every detail of the experiment was carried out to the letter. In fact military discipline probably as much as anything else was responsible for the success of the test. It meant accuracy and regularity.

The nine hundred horses were divided into ten lots of seventy-five each, and seven lots with seventeen to twenty in each. The menu was different in every lot. Some ate oats and prairie hay with a little oil meal as a relish; others had corn and alfalfa with bran for dessert; another lot stuck to barley and timothy hay, and so on. Grain was fed three times a day beginning at 5:30 in the morning, and hay once, at night. They were watered in the morning about two hours after being fed, and in the afternoon they were turned into an exercise lot after returning from their work. They had access to water in this lot and remained there until feeding time at night.

Though the experiment was made with army horses, Dr. Campbell says the results are just as applicable to the feeding of farm and city horses. The work done by artillery horses every day is equal to that done on the average farm.

Your grandfather would have hooted at the idea of feeding alfalfa to horses. That crop had not then attained the versatility as a feed that it now enjoys. Cows, milk animals, had the exclusive right to it, years ago. Later, when it was more generally grown, hogs, if they were well-behaved, would get a bite now and then. But it wasn't for horses. Some farmers had tried it and insisted that it did not agree with their work animals. It was too laxative, they said; entirely out of order as a horse feed. But in late years Western farmers have used it very successfully as horse feed. This test simply proved the assertions of some of the more enthusiastic of these farmers. If alfalfa can live up to the honors it received in this contest it can easily qualify as the poor man's hope. When fed in the proper proportions it proved a much more valuable roughage than timothy, prairie, or any other hay, and was cheaper. There was no evidence of laxativeness and no indication of softness or lack of wind.

But alfalfa that is to be fed to horses, it was discovered, must be cut when it is in full bloom. Ordinarily, alfalfa is cut when only a few blossoms have appeared. The early cut hay and the last cutting, which make the pea-green alfalfa so much desired by dairymen and cattle feeders, is not so satisfactory for horses. It contains too much water; or is too "washy" as horsemen say. So, to make alfalfa hay a satisfactory horse feed it must be cut and fed properly.

Another discovery of this experiment —and this may disappoint you—was that horses which ate oats did not show any more spirit than those getting corn. Close observations on this were made. Of course it's too bad to explode such a fine old theory, but it couldn't be helped, it seems. Hereafter you might just as

HORSE IS NO SNAP.
Riley, Kansas, are just as applicable to farm and city horses.

MILITARY DISCIPLINE HELPED TO MAKE THE TEST A SUCCESS. THE FEEDING WAS DONE WITH ACCURACY AND REGULARITY.

well say that Prince is feeling his alfalfa or his corn. Doubtless alfalfa would be the better word—it's so very stylish just now.

When seventeen selected rations are tried out against one another in a test such as this one at Fort Riley, the interesting results obtained are many, and they are valuable. In addition to those already mentioned the experiment disclosed other facts about feeds, the most important of which are given here, briefly: Oats proved to be slightly better for work horses than corn when fed with timothy or prairie hay. Corn and oats proved more valuable than corn alone but not so valuable as oats alone. Barley has practically the same feeding value as oats. Bran is worth more, pound for pound, as a part of a ration for a work horse than alfalfa meal. Other feeds may be substituted in part for oats in a ration for work horses with as good results and cheaper. Other feeds may be substituted in part for oats with excellent results but with practically no reduction in cost. Timothy hay proved to be of slightly more value than prairie hay as a roughage. No digestive disturbances could be credited to any ration used in this experiment. Horses getting bran, oil meal, or alfalfa hay showed the best condition. The general health and condition of work horses is greatly influenced by the regularity and manner of feeding. Ability to detect individual peculiarities of animals plays a very important part in successful feeding.

Boys Asleep in the Church Yard.

SLEEPING IN THE CHURCH YARD

FOR five or six centuries the old church yard in St. Nichols, in London, was occupied only by the dead. Right across the street stands the building of the Deptford Health Clinic. Here a band of doctors and devoted nurses have done their best for years to bring strength and health to the little slum children of London.

This summer when the hot weather fell upon the city, Miss McMillen, head of the clinic, tried in vain to arrange some plan by which the little patients could be allowed to sleep in the open air.

Finally one day as she sat looking across at the open church yard with its trees and grass, an inspiration came to her. She would turn the old sleeping place of the dead into a bed room for the living.

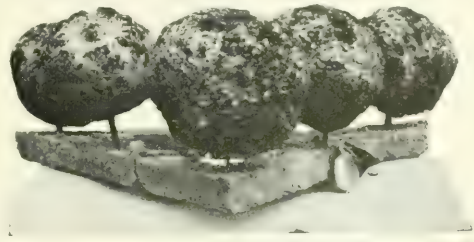
It was difficult at first to get permission from the authorities to use the church yard for the desired purpose. It was again more difficult to persuade the mothers of the little patients to allow their children to sleep in a place so long occupied only by ancient ghosts. But Miss McMillen finally overcame all obstacles.

Little camp beds made of gas pipes and wooden trestles stand under the blossoming elder-berry trees and all summer long sixteen little patients have been gaining health and strength out under the stars. Other similar open spaces are to be used in the same way.

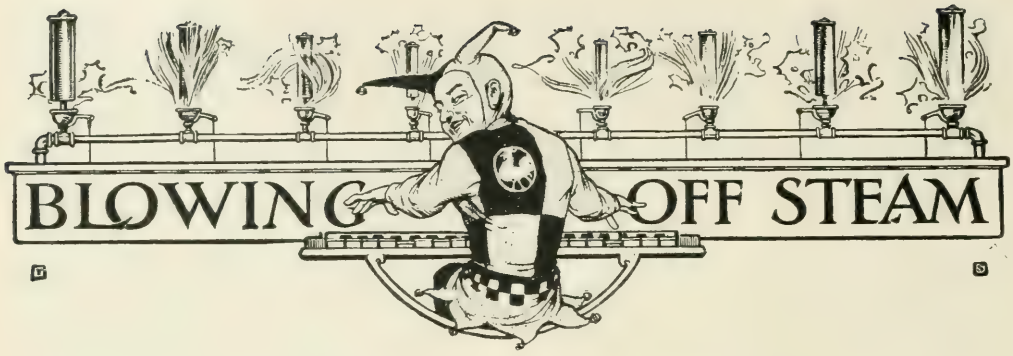
Preparing Breakfast.

GROWING SPONGES IN ORCHARDS

IT is not a matter of general information that there are great areas of sponge orchards planted artificially on the floor of the ocean at considerable depths under the sea. This is, however, a fact and the coasts of Florida are the chief fields of operation. The ordinary methods of starting such an orchard are by planting the small sponges upon pegs placed into cement frames. So arranged, they look not unlike round and well manicured shrubs such as might appear upon the most conventional lawn. Placed on the floor of the ocean these sponges grow rapidly and start others of their kind. Eventually a reef that previously knew not the sponge may become seeded and produce profitable crops.



"Fruit" from the Sponge "Orchard."



Dressed for the Part

"MARIE," asked the star of her maid, gazing perplexedly at her reflection in the mirror, "what was I about to do—step into the bath-tub or go on the stage?"

Marie shrugged her shoulders. "How can I tell? Mademoiselle is dressed for either."—*Judge.*

Sure

"WHAT is home without a mother?"

"An incubator, I guess."—*New York American.*

She Knew

HE—"My dear, you talked in your sleep a long time last night."

SHE—"What did I talk about?"

HE—"Why, it seemed to be mainly abuse of me."

SHE—"I wasn't asleep."—*Cleveland Plain Dealer.*

Torturer

"NOBODY knows how I have suffered," she complained.

"Does your husband abuse you?" her friend asked.

"No, but he can sit for hours without hearing a word that I say."—*Chicago Record-Herald.*

Hardly

"COME now, Hemma," said the Whitechapel bridegroom, "you're goin' to s'y 'obey' when you comes to it in th' service, ain't you?"

"Wot, me?" cried the bride. "Me s'y 'obey' to you! Why, blime me, 'Ennery, you ain't 'arf me size!"—*Tit Bits.*

That Fixes Them

"OH, Mr. Smith," she said, "last night I had such a delightful dream! I positively dreamt that you and I—only you and I, mind—were traveling on our honeymoon. Do you ever have dreams like that, Mr. Smith?"

"I am afraid I used to, Miss Antique," he answered, "but now I am more careful over my suppers."—*Yonkers Statesman.*

A High Liver

"THEY say he lives on the fat of the land."

"Yep; he makes an anti-fat cure."

Should He?

DURING a discussion of the fitness of things in general, some one asked, "If a young man takes his best girl to the grand opera, spends eight dollars on a supper after the performance, and then takes her home in a taxicab, should he kiss her good-night?"

An old bachelor who was present growled, "I don't think she ought to expect it. Seems to me he has done enough for her."—*Lippincott's.*

A Mere Trifle

"Mary is engaged."

"That so? How long has she known the man?"

"Only since yesterday, when she arrived at the seashore. But that doesn't make any difference, since she's only going to know him two weeks anyhow."—*Detroit Free Press.*

Curses!

They were in Italy together.

"If you would let me curse them black and blue," said the groom, "we shouldn't have to wait so long for the trunks."

"But, darling, please don't. It would distress me so," murmured the bride.

The groom went off, but quickly returned with the porters before him trundling the trunks at a double quick.

"Oh, dearest, how did you do it? You didn't——?"

"Not at all. I thought of something that did quite as well. I said, *'S-s-ssusquehanna, R-r-r-rappahannock!'* "—*Lippincott's.*

Modest

The Magistrate (about to commit for trial)—"You certainly effected the robbery in a remarkably ingenious way; in fact, with quite exceptional cunning ——"

The Prisoner—"Now, yer Honor, no flattery, please; no flattery, I begs yer."—*Sketch.*

Not Crazy

"Do you think Oscar proposed to me merely on account of my money?"

"Well, my dear, you know he must have had some reason."—*Fliegende Blaetter.*

Real Logic

"Have you a piece of toast in your pocket," said an inmate of an insane asylum to a visiting physician.

The physician answered that he did not but asked the fellow what he wanted with toast.

"You see," said the poor fellow, "I'm a soft boiled egg and I want to sit down."

Terrible

"A woman came into the hospital the other day and she was so cross-eyed that the tears ran down her back."

"You couldn't do anything for her, could you?"

"Yes, we treated her for bacteria."—*New York American.*

Deep Enough

"Remember, my son, that beauty is only skin deep," warned the Sage.

"That's deep enough for me," replied the young man. "I'm no cannibal."—*Cincinnati Enquirer.*

Prenuptial Sacrifices

"And you are going to give up smoking?"

"Certainly."

"And drinking?"

"Gladly."

"And you will resign from all your clubs?"

"Willingly."

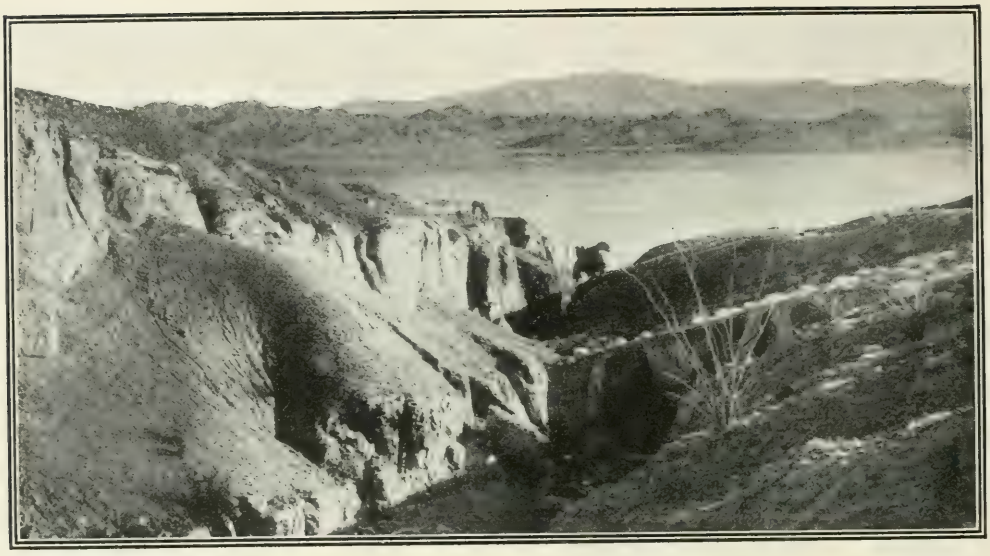
"Think, dearest, if there is anything else you can give up."

"Well, for one thing, I give up all idea of marrying you."—*Soleil.*

Mistaken

Mr. Timid (hearing noise at 2 A. M.)—"I th—think, dear, that there is a m—man in the house."

His Wife (scornfully)—"Not in this room."—*Tit Bits.*



A DRY ALKALI FLAT, THAT IS A LAKE IN REALITY.
The water, however, does not reach the ground surface.

STORING WATER UNDERGROUND

By

WM. ATHERTON DU PUY

IT has come to pass in the West that a parched, alkali desert upon which even sagebrush grows apologetically, may be a storage reservoir for water and still retain its outward appearance of aridity. Beneath such a desert surface the formation may be such that vast quantities of water is impounded just as it is in the crystal lakes that dot the surface of the country. The only difference is that the underground lakes are filled with gravel and the water is merely a filler in as it might be in a sponge.

But the progressive men of the arid West have found a way of tapping these underground lakes and using their water to make the desert bloom. They are now going even farther and resorting to artificial methods in replenishing the water supply underground. They are spreading out the flood waters on the deserts in just the right way in order that they may find their way into the subsurface reservoir and remain there to be drawn upon when irrigation water is scarce. As man has succeeded in stopping the floods that rush down the canyons of the Rockies and impounding them in great reservoirs on the surface, so is he now catching the waters that have escaped into the valleys and spreading them out upon certain thirsty gravels that they may find storage underground and subsequent use. Particularly successful are such operations in those regions around Los Angeles where the desert is being converted into orange orchards that the multitude may have breakfast fruit.

This new method of water storage is valuable only in the arid West where the fertility of the soil and the very life of the people depend upon irrigation. In these regions the lands that lend themselves to irrigation are those that exist in the level valleys into which flow the

streams from nearby mountains. It is the waters from these mountains that furnish the irrigation systems which radiate from these streams or depend upon the flow of artesian wells or water pumped from the underground supply. In every case the water is the vital element that makes possible the existence of a very prosperous community. The size of the community depends upon the amount of water procurable. If this water supply can be doubled the size of the community may be doubled, for these desert lands are usually far in excess of the supply of water that may be procured to irrigate them. Without water they are valueless. With it they are often worth one thousand dollars an acre.

It has been these facts that have started the people of the West along many lines of endeavor to procure additional amounts of water. Underground storage is the latest accomplishment along these lines, having been worked out successfully and on a large scale in at least one community and the possibility of its application to many other sections being readily recognized.

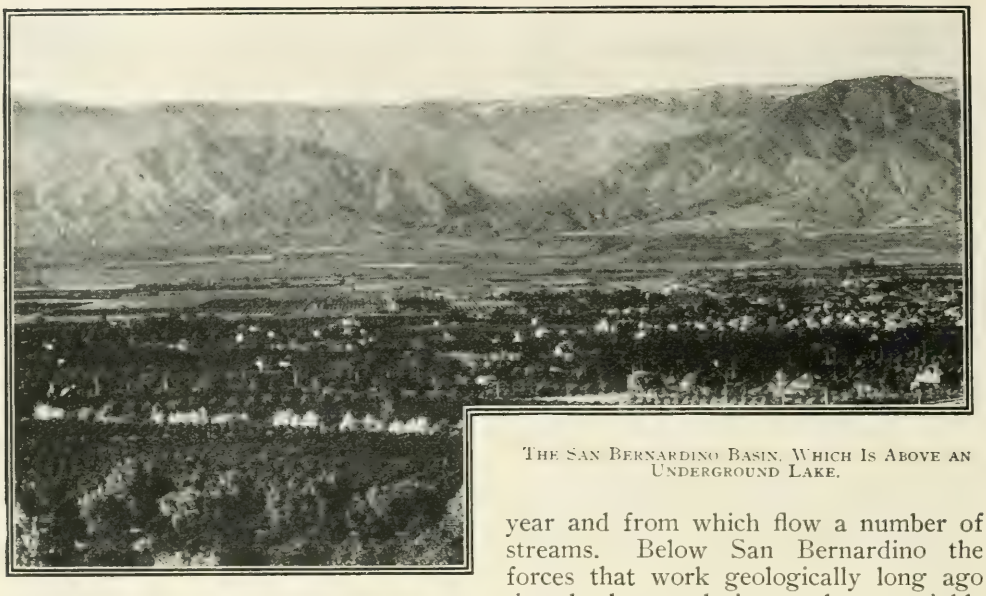
These streams that flow from the mountains of the arid West and into the desert may be rushing torrents when they emerge from the hills but the desert sands steadily take toll of their waters and eventually they disappear. The roaring stream of the foothills runs its nose into the desert until its waters are all drunk up and may no longer be seen upon the surface. These waters have sunk to bedrock and there continue their journey toward the sea. A parched and barren desert may thus have beneath it flowing streams. Across the course of such a desert stream there may be thrown a rocky ridge that stops the course of these subterranean waters, raises their level to the brink of this subsurface dyke and thus impounds behind it a monster reservoir greater than any built by man.

Upon such sources of underground water the people of the West have learned to draw and many a prosperous community owes its existence to such sources. In many cases, also, has the drain been so great upon these reservoirs that their supply of water has been materially decreased. In these cases water famine has come to threaten productive orchards that have grown up with this water as a basis. It is to replenish these underground reservoirs that scientific students of these conditions have been laboring for many years. An important step in that direction has been made and the announcement of the system that leads to it is now ready.

An Artesian Well in the San Bernardino—California—Basin, Replenished by the Seepage of Storm Water.

A Contour Ditch Used for Disseminating Storm Water.

The idea is to get the flood waters into this underground storage basin instead of allowing them to run off to the ocean, for in flood time these streams grow to monster proportions, surfeit their dry beds and pour great



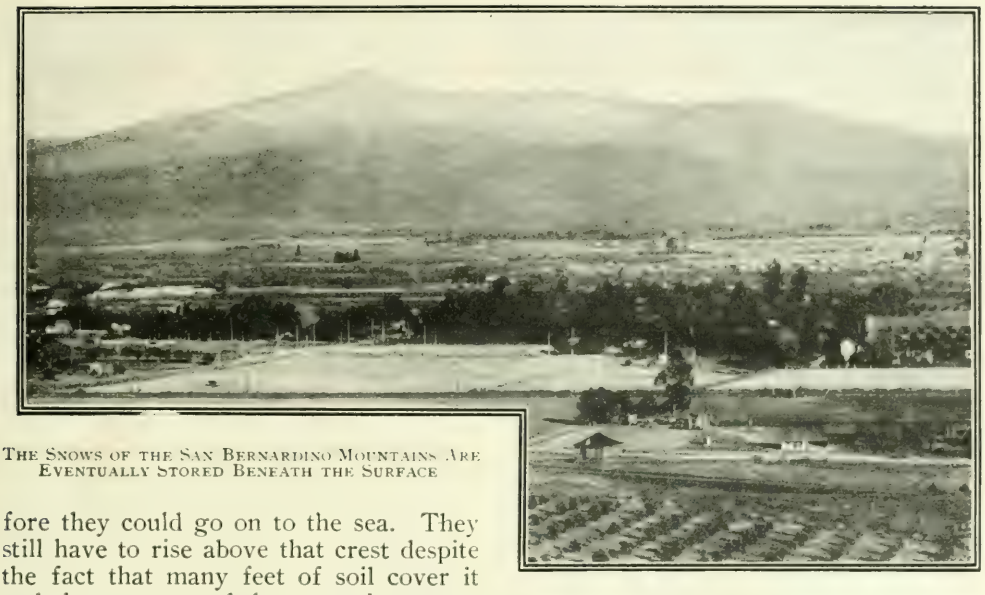
The San Bernardino Basin, Which Is Above an Underground Lake.

quantities of water into the sea. This flood water is to be captured, spread upon the porous gravel near the point where the streams emerge from the mountains, be made to sink into the earth and thus eventually to find its way into the underground reservoirs.

Wherever a stream emerges from the mountains its rate of flow is checked and the larger particles that are washed down from the mountain sides are deposited. It will thus happen that there will be spread out at the mouth of flood bearing canyons a wide fan which will be made up of this rock and coarse gravel. Through this the stream has cut a definite channel and even in flood time rushes madly on toward the sea. The plan is to check this rush by diverting the flood water through many ditches and spreading it out miles wide over this loose rock and gravel formation in order that it may sink into the ground. Thus does it find its way into the storage basin from which it is drawn for purposes of irrigation.

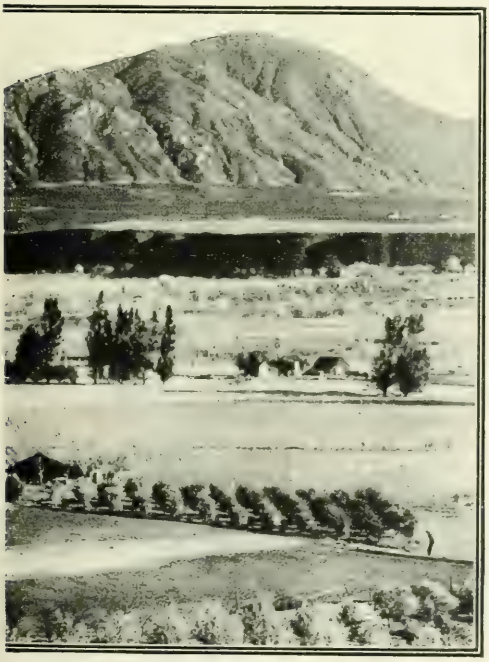
A plan upon this identical basis has been worked out in San Bernardino Valley just back of Los Angeles. The San Bernardino Basin is a typical underground reservoir, some ten miles square. Back of it rise the San Bernardino Mountains upon which there is a heavy rainfall during certain seasons of the year and from which flow a number of streams. Below San Bernardino the forces that work geologically long ago tipped the earth into a huge wrinkle which brought a portion of bed rock near to the surface. Back of this rested a great hole which was eventually filled up by the débris that washed down from the mountains. All the waters from those mountains had to rise above the crest of the wrinkle which barred their way be-

The Riverside Mesa Irrigated



THE SNOWS OF THE SAN BERNARDINO MOUNTAINS ARE EVENTUALLY STORED BENEATH THE SURFACE

fore they could go on to the sea. They still have to rise above that crest despite the fact that many feet of soil cover it and the presence of the water is not apparent upon the surface. So it happens that all the sand and gravel of the San Bernardino Basin is filled with water. Artesian wells sunk into these gravels have flowed steady streams for thirty years. Each year greater numbers of wells have been sunk until it has come to pass that the supply basin is being overtaxed and that the flow of the wells is on the decrease.



WITH WATER STORED UNDERGROUND.

Realizing this the Water Conservation Association of Riverside and Orange counties, began work some ten years ago, in a systematic endeavor to replenish this underground reservoir. At the point where the Santa Ana River emerges upon the level plain from the San Bernardino Mountains, this association secured some eighteen hundred acres of land made up of the stone and gravel washed down from the mountains and useless for farming purposes. Upon this tract of land they constructed a system of contour ditches into which they have been diverting the surplus water of this river for the past eight years. This water that otherwise would have escaped to the sea has been thus made to flow steadily into the ground and therefore eventually to find its way into the basin. This débris cone is from four to five miles from the artesian basin and is from four to five hundred feet above it.

The spreading of the storm water was carried on for several years with little or no appreciable increase in the flow from the artesian well. The amount of water thus diverted into the gravel ranged from five thousand to twelve thousand miner's inches, one thousand miner's inches amounting to nine thou-

sand gallons per minute. Underground waters passing through gravel or sand travel very slowly and it was therefore found that practically no effect upon the flow of the wells of the basin could be noted until last summer. Then, suddenly, the artesian wells began to flow with greater strength. The largest of the companies last summer received a steady flow of six hundred inches over what it had been formerly getting. One of the smaller companies registered an additional flow of three hundred inches. Many of the smaller ditches that had been receiving little or no water during the dry summer months, noted a decided increase and all the artesian wells gave a better flow. The originators of the scheme believe they have proven that the theory upon which they began operations is entirely correct and that the time has come for them to begin to reap the profits they have earned from their period of long endeavor.

The principle thus demonstrated will be applied to other streams and thus will the underground storage be still more greatly increased. Many other communities in the arid southwest which depend as does the San Bernardino upon the conservation of water flow for their very existence promise to adopt similar methods. There is the Yucaipe Basin near by and Riverside Basin supplies artesian water for that equally beautiful town and county of that name.

The city of Los Angeles in connection with its construction of a monster water supply system, has recently acquired, as a storage reservoir, a stretch of barren desert known as Owens Valley. As far as the eye can reach this valley is a barren and alkaline waste. All effort to develop this valley into a community in which men could earn a livelihood has failed. It appears to be an absolutely useless portion of waste land. The authorities having in charge the building of the great Los Angeles Aqueduct suspected, however, that Owens Valley was an underground storage reservoir and prospected it accordingly. Their suspicions were found to be correct, and it was discovered that here was another of those artesian basins that could be drawn upon for large quantities of water. Los Angeles asked Congress to set aside this valley for its use in developing a water supply for the city and Congress complied. Los Angeles intends to draw heavily upon the artesian wells of Owens Valley in times of shortage from other sources. Likewise, in all probability, it will resort to the newly developed system of storing flood waters underground that the Owens Valley Basin may always be kept full and therefore maintained as a reliable emergency water source.

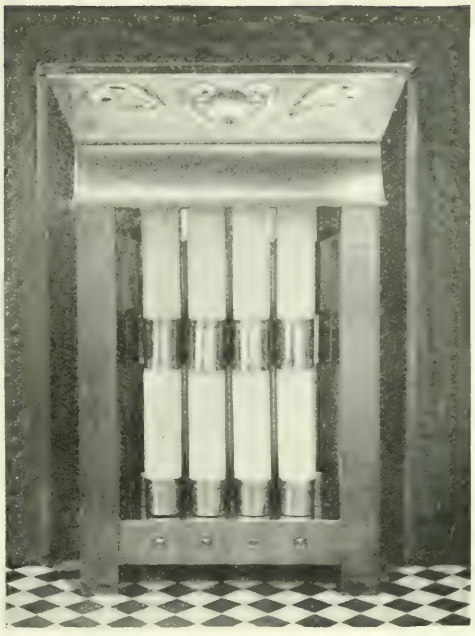
NEW ELECTRIC RADIATOR

THE luminous electric radiator gives its heat immediately with no combustion, no smoke, and no fumes. It is said to be about three times better than coal heating, and twice as good as gas.

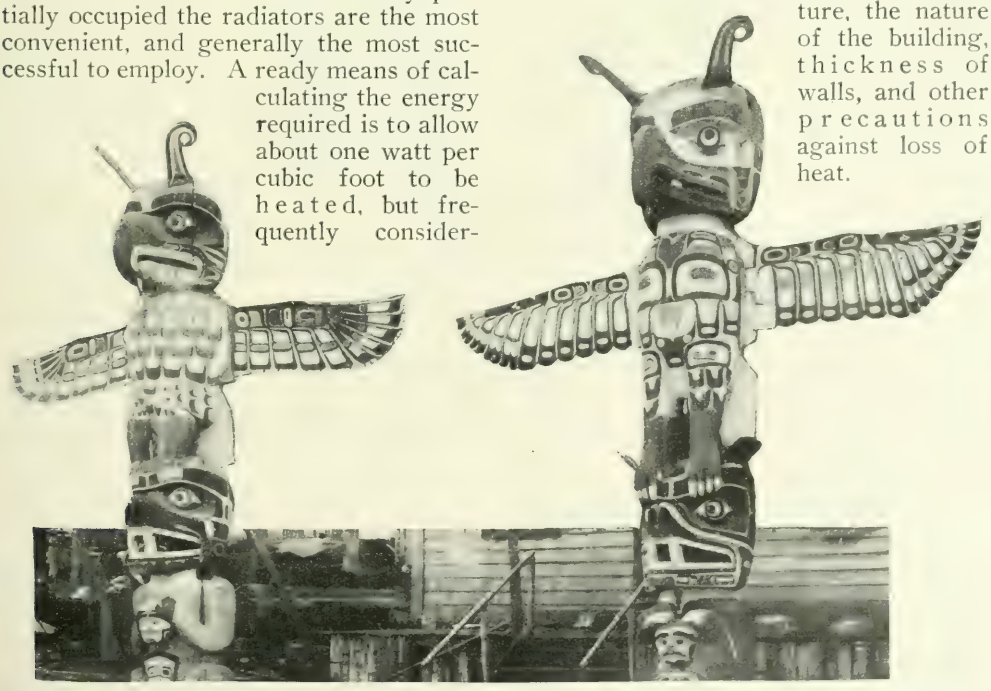
It is claimed that electric heating is the safest, surest and by far the most hygienic system of heating available and is the only system of producing heat without combustion, wherever it is required. The radiators are portable, and are started up or shut down instantaneously. There is, therefore, no waste of energy in either process.

The luminous electric radiators are made to produce powerful heat radiations which are projected in any given direction by means of a special reflector. About seventy-five per cent of the energy used is given out thus as radiant heat, the remainder being utilized to heat the air which passes up through the back of the radiator, and then into the room and no heat is lost up a flue, as with electric heating no flue is required.

The luminous heat rays light up the objects of a room, and give a very cheerful effect. Where a room is only partially occupied the radiators are the most convenient, and generally the most successful to employ. A ready means of calculating the energy required is to allow about one watt per cubic foot to be heated, but frequently considerably less than this will suffice. It is maintained that much will depend on the outside temperature, the nature of the building, thickness of walls, and other precautions against loss of heat.



LUMINOUS ELECTRIC RADIATOR.

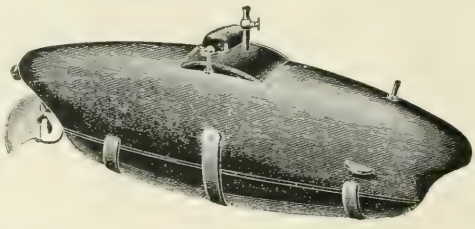


GROTESQUE CARVED TOTEM POSTS IN FRONT OF AN EX-CHIEF'S HOUSE OF THE KWAKIUTL INDIANS, ALERT BAY, A REMOTE REGION NEAR THE NORTHERN END OF VANCOUVER ISLAND.

TO PROTECT THE SUBMARINES

THE constant perils arising from submarine navigation show the necessity of inventions for insuring the safety of the crew imprisoned in these boats; and, from a financial point of view, the cost of building a submarine makes their loss of considerable importance.

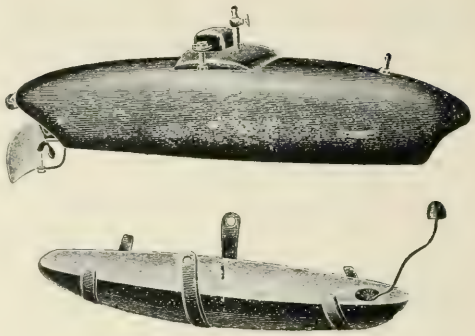
A new design has recently been suggested by a French inventor, which promises an improvement upon those that have already been experimented with. This boat is divided by a horizontal plane into two parts that can be easily separated. The upper part contains all the machinery, the torpedoes, and accommodations for the crew; the lower part forms the water-ballast which is filled with water through an orifice. There are a number of partitions in this compartment which prevent any sudden displacements of the liquid which, if they occurred, would of course disturb the equilibrium of the vessel.



THE NEW SUBMARINE WITH ITS WATER BALLAST AS IT WOULD APPEAR IN ACTUAL SERVICE.

Should an accident occur at the bottom of the sea causing the ship to be unable to move, the two parts can be separated either automatically or by hand. The weight of water is contained in the water-ballast, and with the water ballast itself removed, the boat rises easily to the surface.

When being separated, the water-ballast of the submarine releases a buoy which rises and floats on the surface of the sea, indicating its position and making its recovery possible.



THE SUBMARINE WOULD BE SEPARATED FROM ITS WATER BALLAST IN CASE OF ACCIDENT.

NEW ELECTRIC TRICYCLE

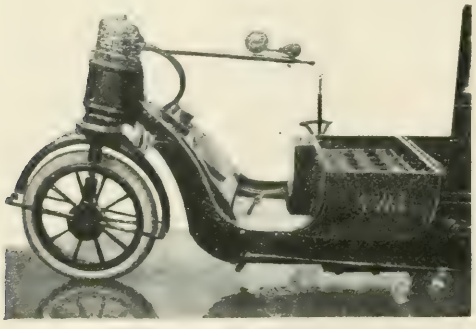
THIS little light vehicle seems to resolve better than its predecessors the problem of the small delivery wagon.

Up to the present time all electric carriages have had the massive appearance of gasoline automobiles constructed for traveling over bad roads. As their dead weight is considerable they necessitate an enormous expenditure for tires and electrical current.

This new French tricycle does away with these difficulties. Its originality lies particularly in the steering arrangement, operated by the guiding wheel in front.

In similar automobile tricycles the motor is placed on the fork in front of the frame, but this necessitates complicated arrangements, besides which, occupying a great deal of room, loads the vehicle in an inconvenient manner.

As our photograph indicates, the motor of the new electric car is placed above on the forward wheel. The twenty-two elements of 2.2 volts which compose its battery with a capacity of 150 to 160 ampere hours are hidden under the seat of the driver. The charging of these accumulators costs seventy cents and is sufficient for traveling from about thirty-one to forty-four miles.



NEW ELECTRIC TRICYCLE.
The motor is placed above the forward wheel.

TECHNICAL WORLD MAGAZINE

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SIX POSSIBLE

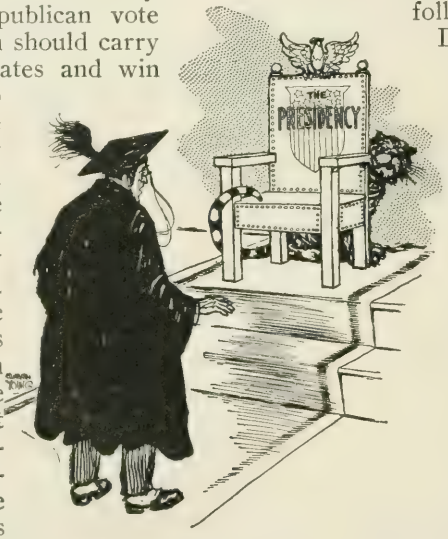
By Henry

IT may be President "Sunny Jim" Sherman, instead of another term of President Taft; it is possible that Hiram Johnson of California may move into the White House, leaving Theodore Roosevelt to return to private life; more improbable things have happened than that Governor Mashall of Indiana should come to preside over the nation, while Woodrow Wilson continues to serve as Governor of New Jersey.

Never, perhaps, in the history of the country has there been a presidential election so full of amazing contingencies and startling possibilities.

Political prophets, men with a taste for statistics, point out that with three strong presidential candidates in the field it may easily happen that not one of the three may get a majority of the electoral votes cast by the states.

If Roosevelt and Taft merely split the normal Republican vote between them, Wilson should carry a majority of the states and win the election—since to get the electoral vote of any state it is only necessary that he get a plurality of the votes cast in November. But if Taft draw from the Democrats a sufficient percentage of conservative votes or Roosevelt enough radical votes from the same source the result might be such a division of the total electoral vote as to leave none of the candidates with a majority. In such an event there would be no election. Extraordinary steps would have to be taken.



IN NEW YORK TAMMANY HALL IS ALMOST A CONTROLLING FACTOR.

Under the Constitution the choice would then be made by the House of Representatives from the three leading candidates—who would certainly be Wilson, Roosevelt and Taft. This responsibility would rest with the present House, which, of course, has a Democratic majority. But in voting for the selection of a President the Congressmen do not vote individually, but by states, the delegation from each state casting a single vote. It is exactly here that the situation becomes sadly tangled and full of startling, even dangerous, possibilities.

In spite of its Democratic majority, when each member of the present House casts his individual vote, the vote becomes a tie when the states are counted as units. On that basis a roll call of the states would result as follows:

DEMOCRATIC STATES—Alabama, Arizona, Arkansas, Colorado, Florida, Georgia, Indiana, Kentucky, Louisiana, Maryland, Mississippi, Missouri, New Jersey, New York, North Carolina, Ohio, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia—Total, 22.

REPUBLICAN STATES—California, Connecticut, Delaware, Idaho, Illinois, Iowa, Kansas, Massachusetts, Michigan, Minnesota, Montana, Ne-

PRESIDENTS?

M. Hyde

vada, New Hampshire, North Dakota, Oregon, Pennsylvania, South Dakota, Utah, Vermont, Washington, Wisconsin, Wyoming—Total, 22.

DELEGATIONS EVENLY DIVIDED—Maine, Nebraska, New Mexico, Rhode Island—Total, 4.

It is plain that with the states in the Republican column divided between Roosevelt and Taft neither could obtain a majority. As for Wilson, he would be obliged to win over the votes of at least three states which are placed here in either the Republican or the Evenly Divided columns—it requiring the votes of twenty-five states to give a majority — and that would seem to be practically an impossibility.

The almost certain result would be that there would be no election in the House.

But before it came time for the House to vote for President desperate politicians might develop a most alarming situation. The electors chosen in the several states do not officially cast their votes until the second Monday in January, 1913, and these ballots are not counted by Congress, in joint session until the second Wednesday in February. Under the law there is nothing to prevent any of the electors chosen by the several states from voting for whomever they please, though of course long custom has made it the rule that they shall vote for the presidential candidate under whose colors they have run. And equally of course the number of Roosevelt, Taft and Wilson electors actually chosen will be perfectly well known by the middle of November at the latest.

Between their election and the actual casting of their votes there is a lapse of more than two months. In the event that no one of the three candidates wins a majority of the electors on the first announcement, it is at least conceivable that attempts might be made on behalf of one or another of the candidates to capture the allegiance of enough electors in pivotal states to change the final result of the election. In this not impossible contingency the excitement largely lacking in the presidential canvas might be transferred in an exaggerated form to the post-election struggle.

WILL ROOSEVELT'S EAGER WOOING OF THE SOUTH PROVE SUCCESSFUL?

If the count of the electoral vote by Congress on the second Wednesday in February shows no majority for any candidate, the lower house must at once proceed to ballot for President, being re-

IT MAY BE PRESIDENT "SUNNY JIM" SHERMAN.

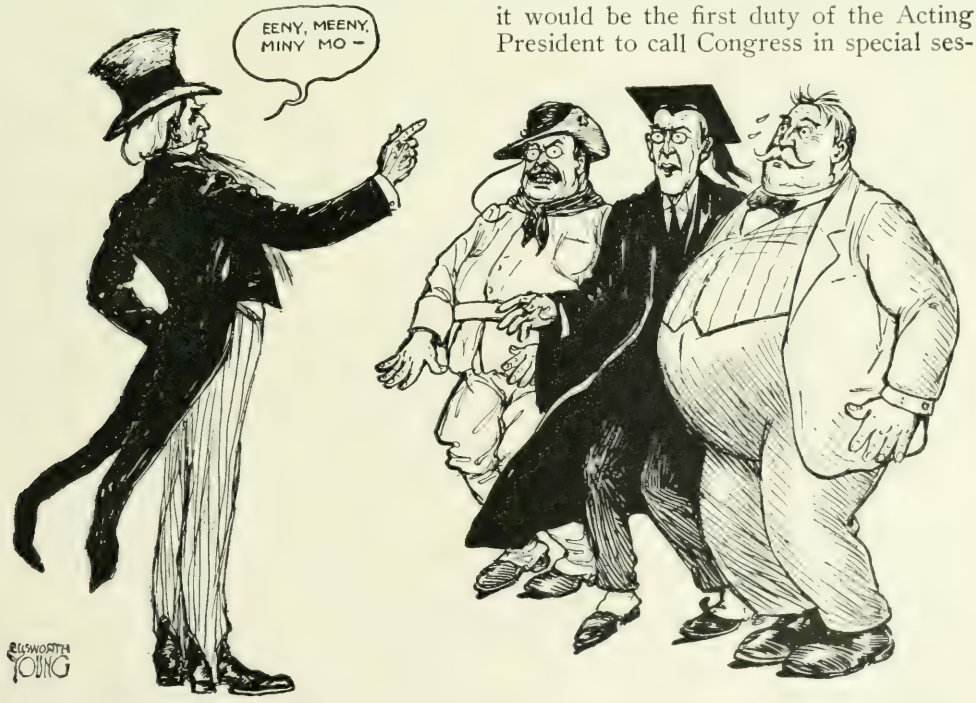
stricted as to choice to the three leaders. There, as has been pointed out, it is apparently impossible that a legal election can be had.

Meanwhile, on the same date, in the Senate, the question of selecting a Vice-President is taken up. But by provision of the Constitution the choice of the Senate is limited to one of the two candidates for Vice-President who received the largest number of electoral votes. It is practically certain that Governor Marshall will stand either first or second, thus eliminating either Sherman or Johnson from the contest before the Senate, where each individual senator has a vote.

To win the election one of the candidates must receive forty-nine senatorial votes. The present Senate is made up of fifty members who are classified as Republicans and forty-four as Democrats, with two vacancies which are to be filled by the legislatures of Illinois and Colorado, respectively. Apparently, therefore, either Sherman or Johnson—whichever one happens to win the larger number of electoral votes—would seem to be certain of election. But, supposing Sherman to be the candidate against Marshall, it is difficult to believe that all of the nine or ten so-called Insurgent Senators would willingly cast their votes for him, and, on the other hand, it is even more incredible that all of the Stand-pat Senators would support Hiram Johnson—particularly in view of the fact that, in case the House fails to choose a President, the man named as Vice-President by the Senate would succeed to the office of the chief executive for the next four years.

All that would be necessary to prevent an election in the Senate would be for four Senators — either Insurgents or Stand Patters, as the case may be—to absent themselves from Washington during the voting.

In that case the presidential election would be a complete failure and on March 4, 1913, when President Taft's term of office expires he would be succeeded, under the Constitution, by Philander C. Knox, Secretary of State, whose office is a continuing one and who would become, automatically, Acting President of the United States. Still following the dictates of the constitutional amendment it would be the first duty of the Acting President to call Congress in special ses-



NOT ONE OF THE THREE MAY GET A MAJORITY OF THE ELECTORAL VOTES CAST BY THE STATES.

sion, giving twenty days' notice to its members.

At this session of Congress, it is presumed, a call would at once be issued for a special presidential election which would probably be held in November, 1913—certainly not a prospect to be looked forward to with equanimity by the country.

The closest parallel to the present situation in the history of the country was in 1824. William H. Crawford was the regular Republican nominee—chosen, as was the custom at that time, by a congressional caucus. Old Andrew Jackson was named by the Democrats. Against these two John Quincy Adams and Henry Clay entered the lists. When the popular election was held Jackson obtained a plurality—but not a majority—of the electoral vote. The fight was transferred to the House, where, finally, John Quincy Adams was chosen President of the United States.

In many particulars that great struggle closely resembles the present one—save that it is now practically impossible to see how any one of the three candidates could legitimately win the votes of a majority of the states.

In the fight among Taft, Roosevelt and Wilson it is pointed out by acute political observers that the question of whether any one of the three can get a majority of the electoral vote is likely to be largely determined by the result of the election in New York and Illinois. A majority of the total electoral vote is 266. New York casts forty-five electoral votes and Illinois twenty-nine—a total of seventy-four, or considerably more than one-fourth of the total necessary. If Wilson carries both of these states his election seems sure. If he wins in New York it is highly probable. The result in Illinois is very uncertain, with three candidates for Governor aggressively in the field. But it takes an optimistic Democrat to predict that the electoral vote of the Prairie state will be cast for the Democratic candidate. In New York a Democratic victory is much more likely. In that state, however, Tammany Hall is almost a controlling factor and Tammany, it is a matter of history, bitterly opposed the nomination of Governor Wilson. Furthermore Tammany being in politics for its own benefit and knowing that it can get fatter picking from a Democratic Governor than from a Democratic President—even of its own choosing—has been before now accused of trading votes for the presidential candidate of the opposition party for Republican votes for its candidate for Governor. The ante-convention fight made on Governor Wilson by the Hearst papers, which has been since followed by exceedingly left-handed support of the nominee, may also be expected to have a considerable effect in cutting down the normal Democratic vote.

Altogether nothing could be more uncertain from the viewpoint of the unprejudiced observer than the result of the coming election. Will Roosevelt, with his shrewd policy in the handling of negro delegates, with his high tariff views and his eager wooing of the Southern vote, be able to break the Solid South and win support which is generally conceded to Wilson? Will the managers of the old machine in states which give huge Republican majorities be able to hold enough men in line to lose two-fifths of their usual vote to Roosevelt and still carry the election for Taft? How many votes will be lost to Wilson by the overconfidence of the Democratic managers? How will the vote of the great class of workingmen be cast in view of the promises made by the third-term candidate and the apparent lack of sympathy shown by both the others? Great questions of race and of religion are also involved—or, at least, studious efforts have been made to make it so appear. A dozen other difficult considerations complicate the problem.

The total number of electoral votes cast by the several states is 531. If two of the candidates run nearly equal, getting approximately 250 votes each, a third candidate, with only thirty votes to his credit will throw the election into the house.

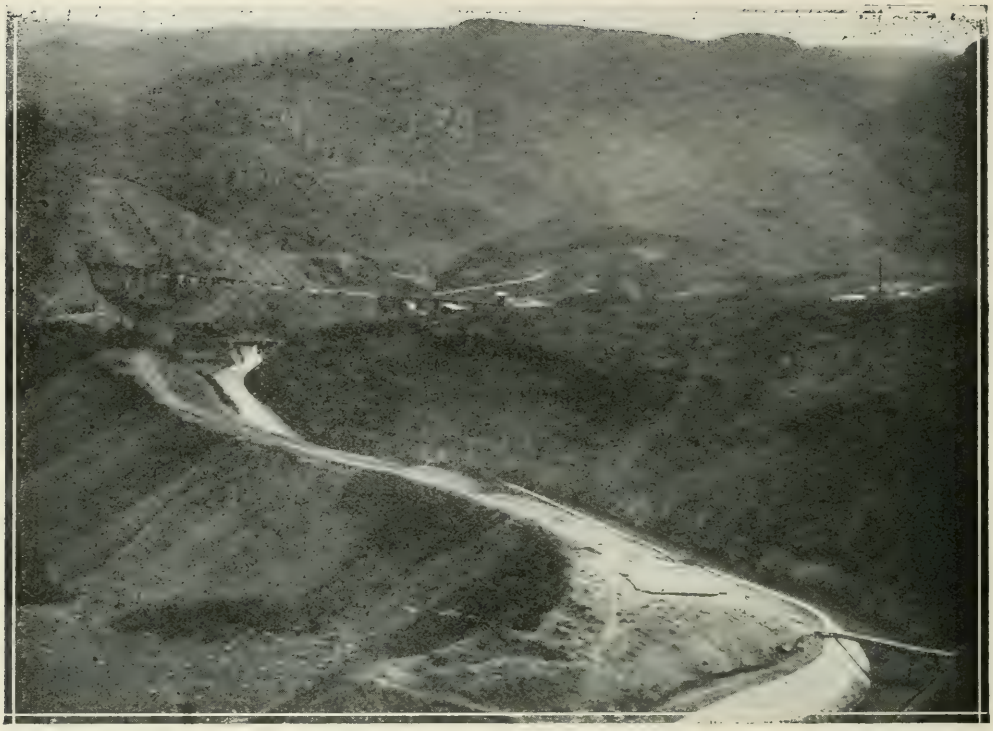
A POWER HOUSE AT NECAXA.
In the distance the Salto Grande Fall tumbles a distance of 740 feet into the gorge. Every pound of material and machinery had to be lowered into this gorge by means of an aerial hoist which ran from the precipice at the left of the falls to the depths below.

WAKING UP A NATION WITH WATER

By

E. ALEXANDER POWELL, F. R. G. S.

IF you are in quest of new sensations you should straightway buy a ticket for Necaxa. It can offer more thrills to the square yard than any place between the oceans. At least that is what ex-President Porfirio Diaz once remarked, and, in view of his own experience, he is the best judge of thrills I know. Nor, should your interests be confined to volts, amperes, kilowatts, triangulations, and hydrostatic heads, will you be disappointed, for Colonel Goethals, the boss-in-chief of the Canal Zone, visiting Necaxa in search of suggestions for the big job on the Isthmus, pronounced it "the most sensational piece of engineering I have ever seen." Which in itself should be sufficient to enlist the interest of users of transit, level, and chain. Or, if it is romance which you seek, hearken to the story of a handful of Americans, who, jeering at the obstacles, racial, political, and natural, which they found before them, converted



ONE OF THE BIG DIVERSION DAMS AT NECAXA.

a tribe of indolent Indians into an army of alert and willing laborers; played a game of bluff with an all-powerful ring of politicians and beat them to a standstill; and, needing water where none was to be had, smote a mountain—like Moses up-to-date—and brought forth a river.

Eight back-breaking and dust-choked hours northwest from the Mexican capital, over the most atrocious combination of rails and ties ever dignified by the name of railway, and you come, dirty, hungry, and tired, to Berestain, the construction camp which is the gateway to the thirty-odd miles of reservoirs, dams, canals, pipe-lines, tunnels, and power-houses where a little band of indomitable Americans have successfully accomplished one of the most remarkable feats in the history of hydraulic engineering.

A dozen years or more ago came a French physician, Dr. Vaquie by name, to Mexico on his travels. Poking about in the out-of-the-way corners of the State of Puebla, he one day stumbled upon a waterfall of amazing height and grandeur, a mountain stream hurling itself over sixteen hundred feet of sheer precipice into the gorge below. *Sixteen hundred feet of fall!* Think of it! Ten times the height of the great American fall at Niagara. Here, if anywhere in the world, thought the Frenchman, water power was to be had for the taking. "Denouncing" the property in accordance with the peculiar provisions of Mexican law, he lost no time in forming a company for the manufacture of high explosives by a process which requires intense heat, such as only electricity can give. The capital stock of 500,000 francs was promptly subscribed by a syndicate of French waiters (think of the number of *pourboires* it needed to make up that sum!) who dreamed of the day when, as stockholders in the great Compagnie du Necaxa, they would own hotels and restaurants of their own. But the day was not far off when their visions of wealth were to be extinguished like a candle in a gale. When Dr. Vaquie had visited Necaxa it was in summer, which, you will understand, is the Mexican rainy season, and the volume of water passing

over the falls was respectable if not enormous. But when he returned, some months later, the dry season had set in, that time of parching drought which lasts from late September until early June, so that, instead of the roaring torrent which had leaped over the brink of the cliff, he found only a slender ribbon of water.

About this time the tide of American commerce began to creep over the country south of the Rio Grande, and with it came an insistent demand in Mexico for cheap power and plenty of it. Foreign investors had acquired control of the lighting and traction systems of the capital; under the ægis of American capital, mills and manufactories were springing up from one end of the Republic to the other; the long abandoned mines of El Oro and Pachuca were being opened up by modern methods and modern machinery. But the cost of coal was prohibitive, and from every corner of the country was repeated the cry "Cheap power and plenty of it." There now appears on the Mexican stage another doctor, Pearson by name, an American, and a Bostonian. With the imagination of a dreamer and the vision of a prophet, this man of exceptional promotive ability saw the astounding possibilities in the Frenchman's played-out waterfall, and, backed by English pounds, German marks, and American dollars, he made an offer for the purchase of the property. Vaquie, only too glad to be rid of so discouraging an investment, and confident that he knew the vagaries of the falls, agreed to accept a price based on the amount of water which passed over the brink in a certain length of time. As the rainy season was then approaching, the shrewd Frenchman confidently expected that he would thus be able to obtain a higher price than by making a hard-and-fast bargain. But the joker worked the other way, for a wholly unexpected dry season ensued, the river dwindled to a rivulet, and the price which the French concessionaires eventually received under their agreement was about half what the purchasers would have been willing to pay.

THE HEADQUARTERS CAMP AT NECAXA, SET IN A VAST REGION OF PLAINS AND MOUNTAINS.

Pearson and his fellow-investors now found themselves the owners of a prop-

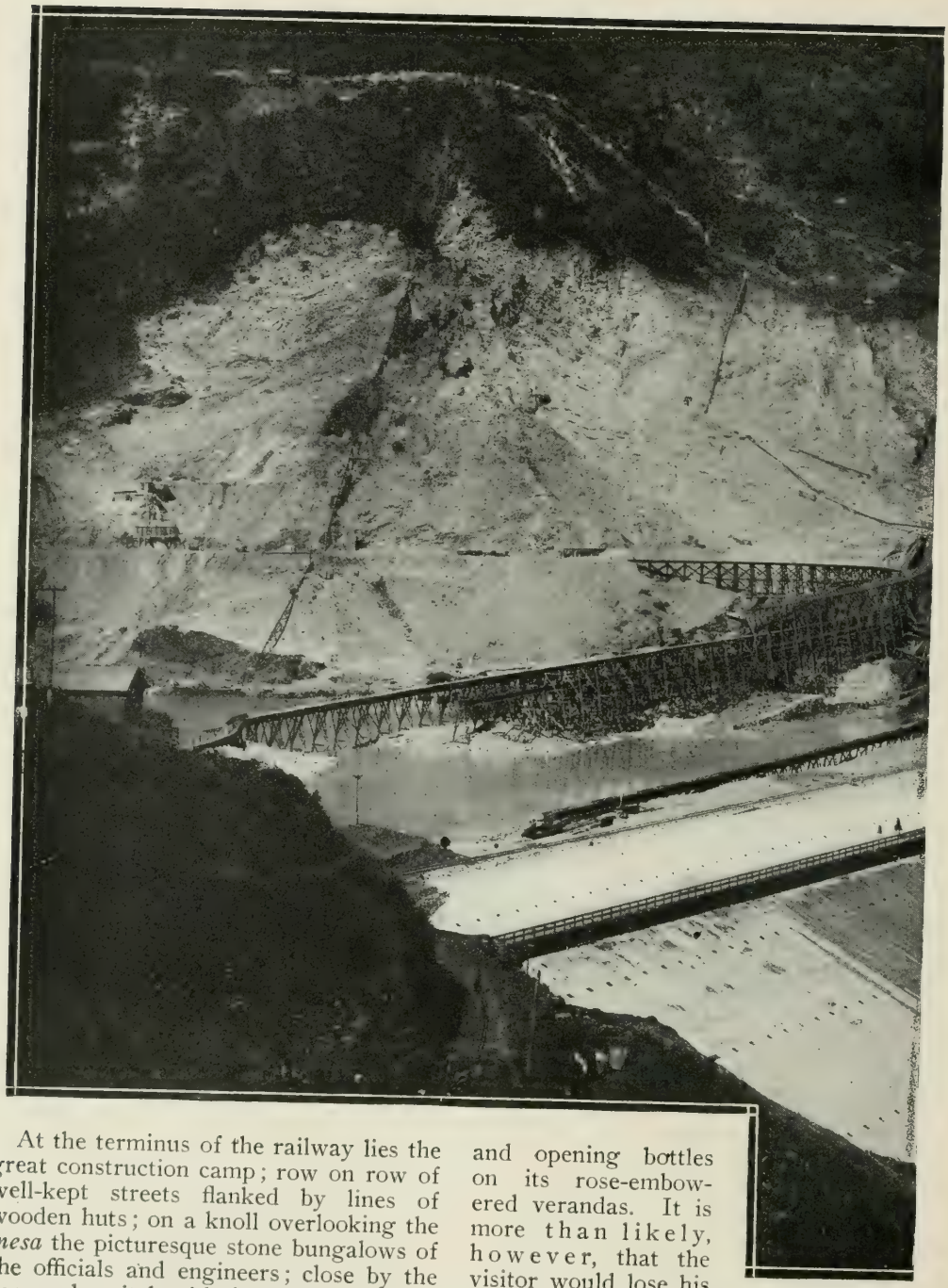
erty which was a respectable waterfall for three months of the year and a mere apology for one during the remaining nine. So from the ends of the earth he summoned men whose business it was to remedy such things—always and only Americans. From the harbor works at Esquimalt and the electric plants at Rio, from the reclamation projects in Babylonia and the barrage at Assuan they came; brown-faced, wiry, confident men in flannel shirts and sombreros, who lost not a moment in driving their stakes and getting their bench-marks and running their levels, for the conversion of a watershed, the alteration of the surface of a state, had begun. In other lands, under different conditions, the maximum water power available the year round is generally regarded as equal to the minimum flow of the stream. But in Mexico, where there is a rainy season, when vast quantities of water fall, and a dry season, with practically no rain, the water question is largely one

THE NECAXA DAM UNDER CONSTRUCTION.

of the conservation of the rainfall of the wet season as an insurance against the dry months which always come. Such was the problem, then, which faced the engineers at Necaxa and which they answered by the construction of three enormous reservoirs, having a combined capacity of five billion cubic feet of water, formed by building three great earthen dams at various points in the Necaxa valley. By means of these dams, the full rainfall, amounting to something over 135 inches during the year, is caught and stored away against the time when no rain falls, just as a great factory stores away coal to keep it in operation through times of shortage and strikes.

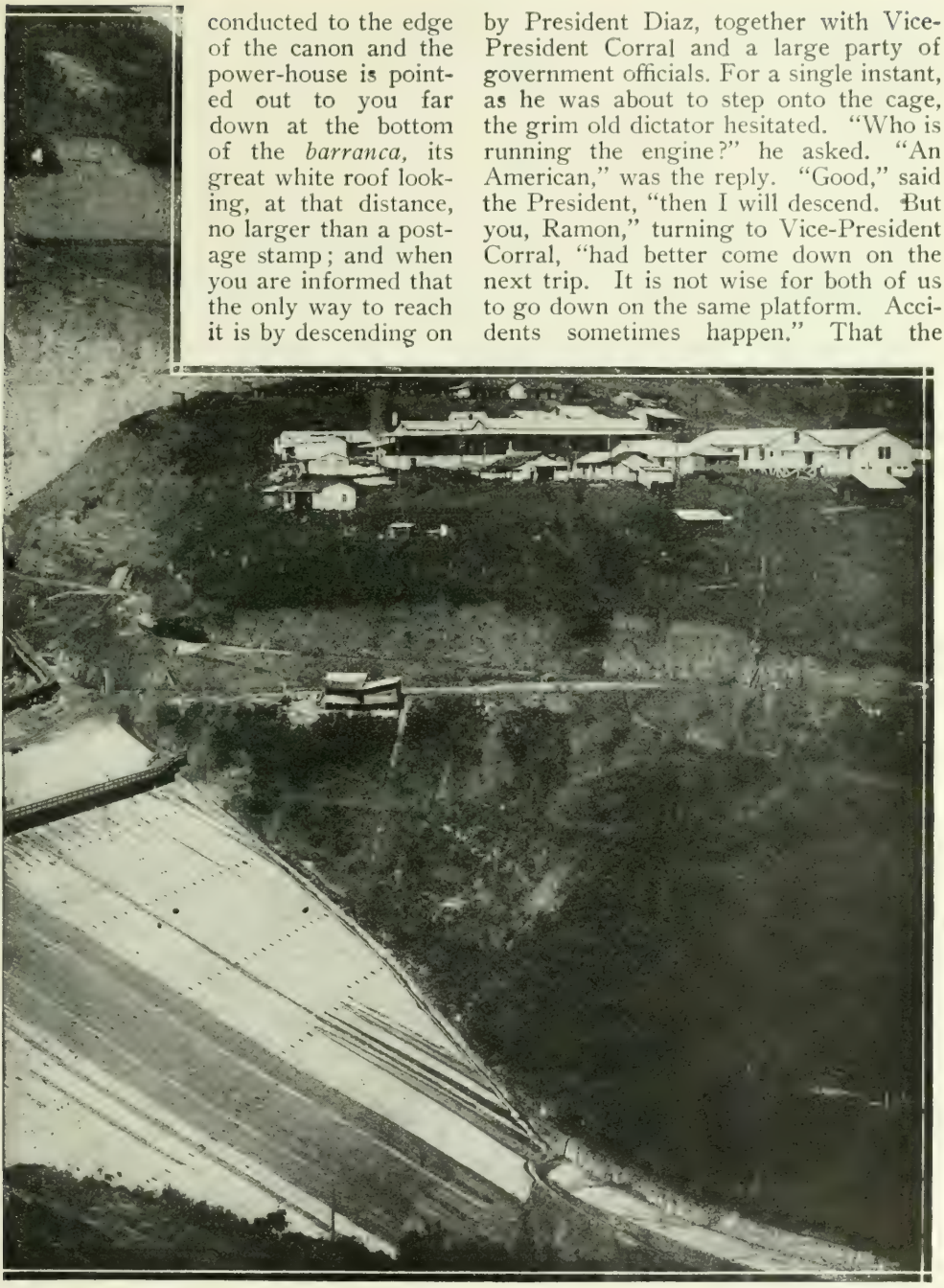
That the entire rainfall of the watershed might be conserved, more than one hundred and fifty streams were diverted from their normal channels by means of canals and diversion tunnels, into a system of reservoirs covering more than six thousand acres, the lower reservoir alone, if full, being large enough to run the plant for two and a half months with no water in the stream at all—a sufficient reserve for the driest recorded years. The volcanic formation of the valley making an unreliable base for stone dams, the engineers decided on earthen dams for all locations, building them by the same method of sluicing which has been used so successfully in the Western States since its efficiency was demonstrated in hydraulic mining. The water is brought in by means of sluice ditches high on the hillsides, and with the head thus gained earth and stones are washed into pipes laid on scaffolding, which carry the water and sediment to the dam site, where, against "toes" built of masonry, it is deposited and the water run off, the heavy material staying at the outside and the lighter settling slowly in the center of the dam. The largest of these dams, known as the Necaxa, is the highest earth dam in the world, exceeding by seventy-nine feet the much advertised Gatun dam at Panama. Figures are dry things at best, but some idea of its immense size may be gained from the statement that it is more than half the height of the Washington Monument, nearly twice the length of the National Capitol, and cost more than a million dollars.

The first great problem which confronted the engineers at Necaxa was the tremendous one of getting their material on the ground, for at that time the base camp was fifty miles from the nearest railway. Two thousand feet below the base camp lay the *mesa*, or mountain-walled tableland, which had been selected for the reservoir sites; and sixteen hundred feet below the *mesa*, at the bottom of a gorge with perpendicular walls of rock, was the location decided upon for the power-houses. By an immense expenditure of time and labor the engineers succeeded in constructing a highway from the camp down to the *mesa* in the belief that their structural material could be transported over this road on wagons drawn by traction engines. But with the rainy season came the mountain torrents, and such portions of the road as were not completely swept away were left impassable with mud. So the men in the flannel shirts tightened up their belts and took a long breath, as it were, and attacked the seemingly unsolvable problem of building a railway down a mountainside where a goat found it dangerous to venture. Eventually the railway was completed, however, and there is not its like in all the world. Its curves are really corners and its gradients hair-raising drops. For close on thirty miles this preposterous railway twines in and out, backwards and forwards, clinging to the face of the precipitous cliffs like a fly on a wall. Ninety-seven per cent of this amazing line is curvature, and on one section there is a grade of thirty-three per cent. So abrupt are the curves that they can be negotiated only by Shay engines, the cars, each of which is manned by two brakemen, being kept apart by couplings six feet in length. One's first sensation at Necaxa is provided by the descent into the valley strapped to the front of an engine. So sharp and sudden are the curves that the frightened passenger shuts his eyes and murmurs a prayer as the engine heads straight for the edge of a precipice, hovers for a terrifying instant on the dizzy brink, and then sheers sharply to one side like a frightened horse, only to repeat the hair-raising performance again and again, until beads of cold sweat stand out upon one's forehead.



THE GREAT

At the terminus of the railway lies the great construction camp; row on row of well-kept streets flanked by lines of wooden huts; on a knoll overlooking the *mesa* the picturesque stone bungalows of the officials and engineers; close by the roomy hospital with its genial German surgeon and his corps of white-clad assistants—for in such an undertaking are many accidents;—and, of more immediate interest than all else to the hungry visitor, the long, low guest-house with silent-footed China boys setting tables and opening bottles on its rose-embowered verandas. It is more than likely, however, that the visitor would lose his appetite if he knew the afternoon's entertainment that was in store for him, for the coffee cups have scarcely been taken away when a message comes that the cages are waiting. That in itself sounds sufficiently ominous, but when you are



TENANGO DAM AT NECAXA, SHOWING THE METHOD OF FILLING BY MEANS OF SLUICEWAYS.

conducted to the edge of the canon and the power-house is pointed out to you far down at the bottom of the *barranca,* its great white roof looking, at that distance, no larger than a postage stamp; and when you are informed that the only way to reach it is by descending on a tiny platform which swings out over the abyss on a slender wire, you are likely to have a shivery sensation creep up your spine. A few months before he went into exile, the Necaxa plant was visited by President Diaz, together with Vice-President Corral and a large party of government officials. For a single instant, as he was about to step onto the cage, the grim old dictator hesitated. "Who is running the engine?" he asked. "An American," was the reply. "Good," said the President, "then I will descend. But you, Ramon," turning to Vice-President Corral, "had better come down on the next trip. It is not wise for both of us to go down on the same platform. Accidents sometimes happen." That the President was not going to have any accident happen to him, if he was able to prevent it, was shown by the four *rurales* who stood, with drawn revolvers, around the man who ran the engine while

NECAXA RESERVOIR, DAM, AND PENSTOCKS CONVEYING WATER TO THE POWER HOUSES.

General Diaz was descending. No accident marked his visit.

The great white building which lies in the bottom of the canon, sixteen hundred feet below the level of the *mesa,* is the largest power plant in the world under one roof, it being doubly remarkable when it is remembered that every brick, every girder, and every barrel of cement used in its construction was lowered from the rail-head into the *barranca* by means of the flimsy-looking aerial hoist which I have just mentioned. The transportation of machinery, which in several instances weighed upwards of seventeen tons, through half a mile of space, by means of platforms running on a seven-eighths-inch cable, at an incline only thirty degrees from the perpendicular, was a feat so daring in its conception as to be pronounced impossible by all the foreign engineers who were consulted on the subject.

It is not until one has reached the power-house, which from above looked so small and insignificant in its mountain setting, that one appreciates the true magnitude of this gigantic undertaking and marvels at the success of the promoters in finding even one spot so admirably adapted to great power development no less than at the daring of the men who have done the work. The present power plant is a steel-and-concrete structure containing six generators of 8,200 horsepower each, and four of 16,000

horsepower each, operating under a head of 1,460 feet, which, it might be explained for the benefit of the layman, is the difference in elevation between the water level in the reservoirs and the turbine nozzles. The plant is at present capable of developing 112,000 horsepower, but a lower power house is now under construction, where, under a head of 2,100 feet, an additional 140,000 horsepower will be generated, thus placing at the disposal of the company the enormous total of a quarter of a million horsepower.

One of the serious obstacles with which the engineers at Necaxa have had to contend is the ingrained carelessness and fatalism of their seven thousand Indian workmen. Not only does this habitual recklessness result in the injury or destruction of much valuable machinery, but it provides constant occupation for the surgeons in the company's hospital and the grave-diggers in the company's cemetery. The long unguarded stretches of copper transmission wire proved particularly tempting to thieving workmen, notwithstanding the fact that several of them met untimely ends by electrocution, and it was not until the company induced the Mexican Government to pass a law making it a capital offence to tamper with the transmission lines, and until several offenders had been summarily shot in consequence, that such depredations ceased. The fatalism of these Indians (the people of the Necaxa region, it is interesting to note, are direct descendants of the Aztecs and still speak the Aztec tongue) is almost incredible. A few months ago a group of workmen, among them two brothers, going to their work at the power-house in the *barranca,* walked onto the cage which swings out over the Chico Grande fall, and signaled to the engineer to lower away. One of the brothers, stepping to the edge of the platform, carelessly threw down his blanket for a cushion and started to sit upon it, his feet dangling over the giddy abyss. But the blanket slipped, and the man with it, his body turning over and over in horrible gyrations until it struck the rocks a quarter of a mile below. "We'd better go over and get the body," said one of the workmen, as the cage reached the bottom of the descent. "What's the use?" remarked the brother, picking up his dinner-pail and starting for the power-house, "Juan's dead, isn't he?"

The six hundred square miles of land on which the Necaxa project was worked out were purchased by an army of agents, who, in some cases, were forced to pay its Indian owners as high as two hundred dollars an acre. Seven villages —four of which are now wholly submerged by the water of the reservoirs— were bought outright, it being stipulated that the company must erect on other sites towns that would be duplicates in every respect of those they had purchased. Where the lands bought had been used for the cultivation of grain and fruit, the prices demanded were particularly high, the owners of corn lands being reimbursed on the basis of two cents for each hill of corn, and, where beans had been planted between the corn-rows, as is frequently the case in Mexico, three cents additional was paid for each hill of beans.

Considering the fact that the company's operations involved the transfer of the population of a whole district, there was surprisingly little friction between the officials and the natives, this being due in large measure to the good offices of the parish priests. The real trouble came from wealthy hacienda owners, and from corrupt government officials who thought they saw an opportunity to obtain a few dishonest thousands. In running its transmission line from Necaxa to the City of Mexico, the company found it necessary to cross the property of an influential planter. Although but slight damage was caused to his land by the installation of the overhead wires, the *hacendado* refused to accept the three thousand dollars indemnity offered him by the company, and carried the case into the local courts, the presiding judge of which was his intimate friend. This judge promptly found against the company, ordering it to buy the entire plantation for thirty thousand dollars. The company appealed to the Supreme Court of the Republic, which upheld the decision. This being in the days when Diaz and Mexico were synonymous, the company's attorneys brought the circumstances to the atten-

tion of the dictator himself, who, after examining the merits of the case, summoned the members of the supreme bench before him. "You must reconsider your decision, gentlemen," he said, in effect. "We need foreign capital in Mexico; we are doing everything in our power to induce it to come here; and when it does come we must do everything possible to assure the capitalists that they will be protected. Such a decision as you have rendered is not just and, if enforced, it might well do incalculable harm to the financial interests of the Republic. You will therefore reconsider the case and render another decision." The Supreme Court at once directed the lower court to give the company another hearing. This time the lower judge ordered the company to pay his friend, the *hacendado,* twenty thousand dollars. The company refused point-blank to pay and the court ordered its property seized and sold at public auction. "Go ahead and seize," said the company's attorneys. "We are the only concern in Mexico that are in a position to bid in this particular property, and we will also take care to see that the story of this travesty on justice is published broadcast in Europe and America, so that foreign investors may know what treatment to expect in Mexico." The news of this threat quickly reached the ears of Diaz, who lost no time in sending for the members of the Supreme Court, and this time, without parley or explanation, curtly ordered them to set the damages at three thousand dollars, the amount originally offered by the company—which was done. The incident is interesting as illustrating some of the non-engineering difficulties with which the builders had continually to contend, and as showing how such questions were settled in the days when Don Porfirio sat in the Mexican chair of state.

The Necaxa plant as it stands today represents an investment of upwards of fifty million dollars, a sum which, vast though it is, will be more than doubled before the entire project is completed. Power is today being transmitted to the mines at El Oro, two hundred miles away, over the longest transmission line in the world, and light and power rates in the City of Mexico have been cut in two. With the completion in the near future of the great auxiliary powerhouses now under construction in the lower gorge at Necaxa, towns will be lighted, street cars will be operated, mines will be opened, and factory wheels will revolve throughout all Central Mexico—and this industrial awakening will be due to a remote waterfall and to the resourcefulness and daring of the handful of Americans who harnessed it.

GUARDS PLACED ON SHIP'S CABLES TO PREVENT PLAGUE-BEARING RATS FROM GETTING ASHORE.

TO BUILD OUT THE PLAGUE

By

RENÉ BACHE

HOW much will it cost to build the "plague" out of our seacoast cities? Can we do it for $100,000,000? Will even half a billion dollars be adequate to accomplish the work? This is a problem which we shall soon be obliged to face, and we might as well begin to think about it now.

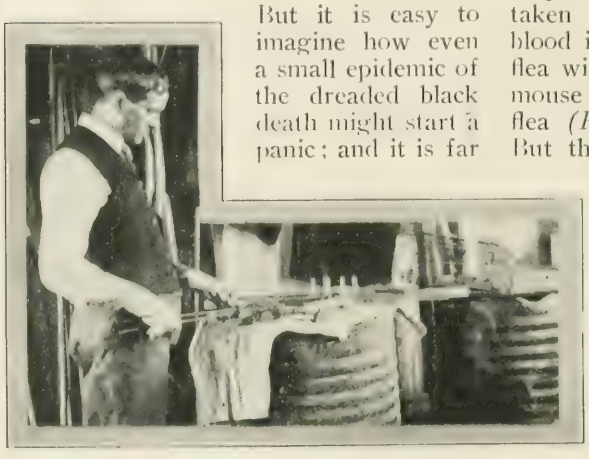
The imminence of the danger now threatening our shores is by no means generally realized. It is the policy of the Federal health service to alarm the public as little as possible. Nevertheless, the disease that holds rank as the most destructive enemy mankind has ever known has arrived in New Orleans, and there is only too good reason to fear that the rats in other American seaports are already infected with it.

Originally a disease of rats, it is carried by them, on shipboard, from port to port. Starting from somewhere in Asia, nobody knows how many thousands of years ago, it has repeatedly devastated Europe. In the fourteenth century, for instance, it wiped out one-fifth of the entire population of that continent. Having secured a foothold in San Francisco five years ago, it was driven out by the public health service, after a remarkable campaign which involved the rat-proofing of the entire city. Since then it has been threatening us from other quarters, mak-

Dr. Rupert Blue, the New Head of the Public Health Service, Who Is Managing the Plague Campaign.

ing its appearance recently in Cuba and Porto Rico, and there would be no cause for surprise if an outbreak of it in New York, Baltimore, or Boston were announced in the news dispatches any day.

Public feeling on the subject as yet is not one of alarm. Confidence in the knowledge and skill of the health authorities pervades, and with good reason, our communities. But it is easy to imagine how even a small epidemic of the dreaded black death might start a panic; and it is far from unlikely that, within even a few months from the present time, an alarm of the kind—helped on, as a matter of course, by sensational newspapers—may create nation-wide excitement and dismay.



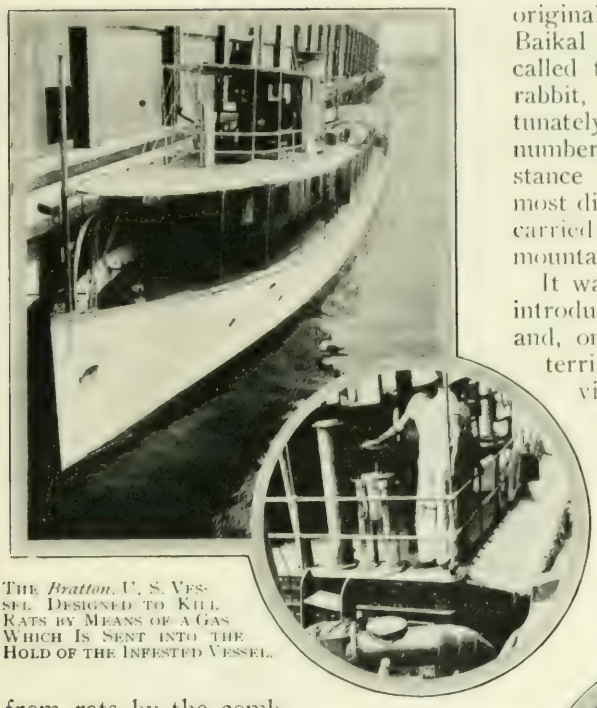
Combing a Rat for Fleas.

Such excitement, however, would hardly be warranted; for it may be assumed that the Federal health service, taking the situation promptly in hand, would be able to deal with it effectively. Fortunately, we are no longer living in the Middle Ages. The plague today is no mystery, to be attributed, as of old, to the wrath of God or other supernatural causes. We understand all about it. We have identified the germ; we know how the disease spreads, and we are acquainted with the means whereby it can with certainty be eradicated.

In the meantime, what are the health authorities doing? The answer is that, while getting ready for more vigorous action in case it shall be needed, they are watching the seaports with anxious eye, and trapping rats—especially such of these rodent animals as infest the docks and the neighborhood of docks; for these are likely to become infected first. As fast as they are caught, they are combed for fleas and subjected to post-mortem examination, in order to discover whether any of them are suffering from plague.

One should understand that the real carrier of plague is not the rat, but the rat flea. The insect bites a plague-sick rat, then bites a human being, and thus communicates the disease. The process is purely mechanical, the germs being taken into the flea's stomach with the blood it swallows. Indeed, any kind of flea will serve—the cat-and-dog flea, the mouse flea—which is blind—the human flea *(Pulex irritans)*, or other species. But the rat flea is usually accountable for the mischief because it is the special and peculiar parasite of the animal most commonly afflicted with plague; and, if hungry, it will, and does, attack people.

Were it not for the flea, there would be no plague. Yet the fact that this insect is the agent of transmission has been known for scarce half a dozen years. The business of removing fleas



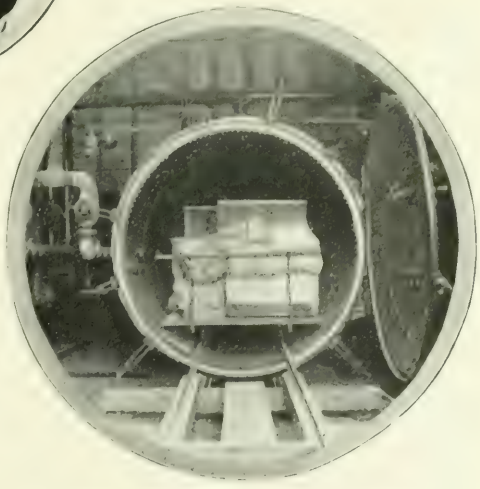
THE *Bratton*, U. S. VESSEL DESIGNED TO KILL RATS BY MEANS OF A GAS WHICH IS SENT INTO THE HOLD OF THE INFESTED VESSEL.

from rats by the combing process is undertaken partly to find out how many of the insects there are per rat, per sex of rat, per species of rat, and so forth. There is more than one kind of rat flea. In fact, the whole subject is much more complex than one might imagine; and the data secured in this way have a fundamental value in relation to the practical problem which the experts are making ready to attack.

The question whether the fleas themselves are infected is decided in a very simple manner. One of the insects is ground to a pulp; its remains are put into a suitable "culture medium," and, when the resulting culture has had time to develop, some of it is introduced with a hypodermic syringe into the body of a guinea-pig. If the guinea-pig dies of plague, it is obvious that the flea was loaded with the *Bacillus pestis*.

There are other creatures besides rats and human beings that in nature are subject to this frightful malady. In California the ground squirrels have become widely infected with it—doubtless from rats originally. Likewise, in the Trans Baikal region of Russia, a rodent animal called the tarbigan, resembling a large rabbit, is afflicted with plague. Unfortunately, the tarbigan is trapped in great numbers for its furry pelt—a circumstance which recently has given rise to most disastrous mischief, the skins being carried in packs by traders across the mountains into Manchuria, for sale.

It was by this means that plague was introduced not long ago into Manchuria, and, once arrived there, it spread with terrifying rapidity. The inns provided for the accommodation of travelers in that part of the world are of the primitive Chinese description, and the guests customarily sleep on the floor, huddled together as closely as space will permit. The conditions thus established are ideal,



STERILIZING PLAGUE INFECTED BEDDING.

DISINFECTING A PLAGUE INFESTED HOUSE IN SAN FRANCISCO WITH CHEMICALS.

DISINFECTING A HOUSE WHERE THE PLAGUE HAS BEEN.
Two of the men are using "flea guns," filled with a disinfecting solution. Others are papering the walls. The pots contain sulphur, which will be set on fire.

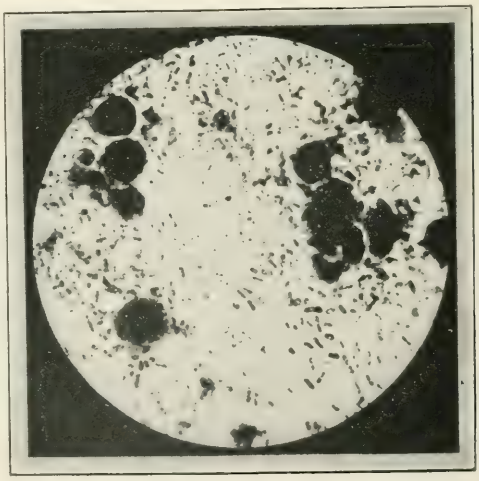
of course, for the communication of infection through the medium of fleas. Consequently, it was not long before plague was sweeping the country like flame driven before a high wind, and when, after a while, it assumed the "pneumonic" form, it literally wiped out whole populations.

When the lungs of a plague-stricken person become infected, there is no longer any need of the flea to carry and distribute the disease. Every time he coughs or sneezes, the germs are scattered about. Finding their way into the air, they are taken into the lungs of other people, in breathing, and the epidemic assumes a devastating phase. The very atmosphere is poisoned, and people die like flies. When, a short time ago, the malady was at its most destructive height in Manchuria, populous villages lost all their inhabitants within a few days, scarce a single individual surviving.

Should plague invade one or more of our cities, and assume the proportions of a really serious epidemic, enormous commercial losses would result, especially if it were found necessary to establish a quarantine. Such a quarantine, covering traffic of all kinds, might isolate a community, putting a stop to all intercourse with the outside world, and even preventing people from going out or away from the city. A cordon, guarded by military, would be established, and nobody would be allowed to pass it. There is difficulty in realizing the immensity of such a calamity.

Apart, then, from any anxiety that may be felt for the safety of human lives, it is a matter of urgent necessity to provide against an invasion of the kind. The first thing to be done is to keep a lookout for infected rats. Plague-sick rats have already been caught in New Orleans, and it is likely that they will be found at other seaports along the Atlantic and Gulf coasts. The next step is to destroy the rodents as far as possible by trapping and poisoning, and to get rid of the survivors by rat-proofing their places of refuge. Work of this kind naturally begins along the wharves.

If an epidemic of plague breaks out among human beings in any quarter of a city, with the Federal health service in charge, every house in the neighborhood will be disinfected and made rat-proof by the use of concrete or otherwise. Accumulations of refuse will be cleared away. Shanties will be elevated above the ground sufficiently to enable cats and dogs, the natural enemies of rats, to run beneath them. Sewers will be rat-proofed. In short, no place will be left



CULTURE OF *Bacillus Pestis*, THE GERM OF PLAGUE.

where a rat can find shelter. Where there are no rats there can be no plague.

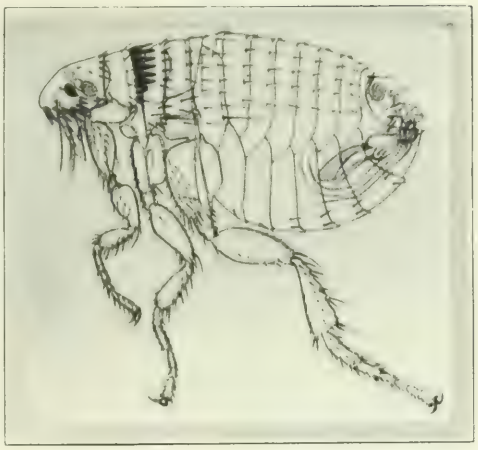
Rat-killing is already going on extensively in the Atlantic Coast cities. The *Bratton*, of the United States marine hospital service, is assisting in the campaign. She is equipped with a rat-killing device, the invention of Dr. George Harker, one of the foremost chemists of Australia. The device was originally intended for use in fighting fires in the holds of vessels. The method is to draw out the gases which ascend through the funnel of a steamship from the conflagration, modify them slightly and then pour them into the burning hold. As these gases contain no oxygen they gradually drive out all the oxygen from

THE HUMAN FLEA.

the vessel, and necessarily the fires die out.

Dr. Harker has also made a study of the bubonic plague, and he reasoned that not only do the gases generated to fight fires displace oxygen, but some are deadly to animal life. He went to the government officials in charge of the crusade against the bubonic plague and as a result the *Bratton* was fitted out with his device.

The *Bratton* will tie up alongside the sugar and banana boats from South America and the West Indies and from her machinery the killing gases will be poured into the holds of these ships. Under a recent government order rats must be killed on all ships coming from



THE CAT-AND-DOG FLEA.

the West Indies, South America, Africa, Russia, China, India and the islands of the Pacific.

An idea borrowed from the Chinese is being put into effect to keep rats from coming ashore from ships arriving from suspected plague districts. The hawsers of the ships are protected by metal disks so that rats cannot walk ashore along the ropes, as they are in the habit of doing when the ship is docked. The disks are of polished metal with a radius of about a foot and no rat can surmount this obstacle. Every hawser is protected in

THE MOUSE FLEA, WHICH IS BLIND.

this way and the health authorities can then go aboard the ship and exterminate the rat. Any one of the rodents seeking to escape by way of the hawser is either forced to return or to drown.

STRANGE ANIMALS THAT INHABIT THE SEA

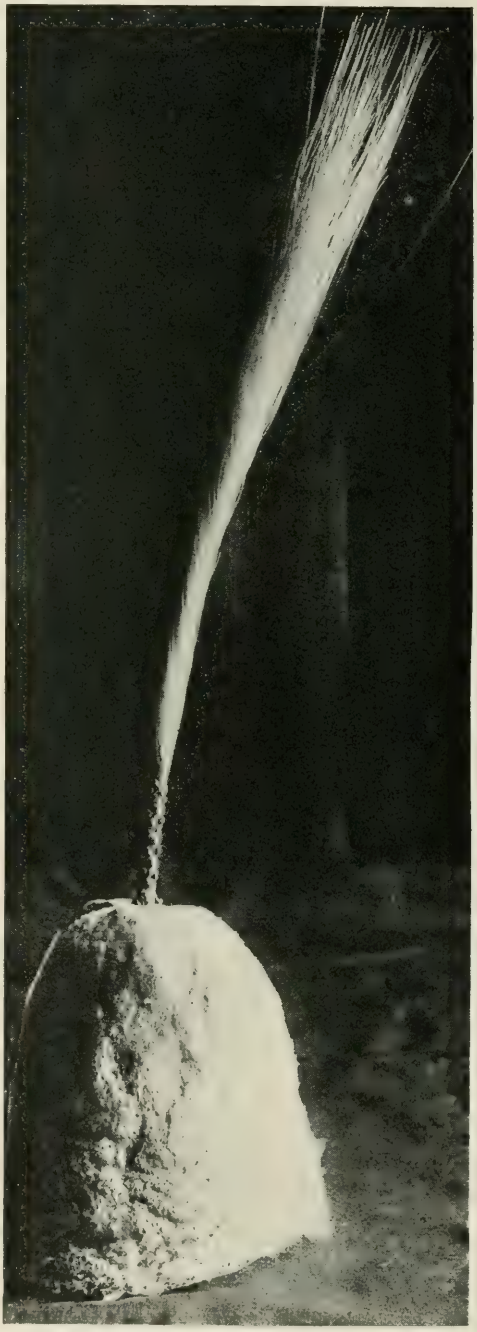
IT is in the ocean where we find the lower order of animal life, living creatures so closely resembling plant and animal, that for years our most noted naturalists were unable to classify them. When we come to examine the organisms which stand as it were, on the confines of the animal and vegetable kingdom, we realize how difficult it is to see the precise line of demarcation which separates these great kingdoms of Nature; we find among them the first step in the scale of animal life, and of course in a very rudimentary form.

The great variety of corals, sponges, shells and fishes are almost innumerable, and most people are familiar with many of them, but to see them in their native element is a different thing. The sea plume, quite a common object in nature, though an animal, has the appearance of a plant.

The commercial sponge everyone has seen, but the venus flower basket, and the glass-rope sponge, are very rare and beautiful. The frame work of the latter is composed of silicious spicules, which are pure white and have all the appearance of spun glass. The spicules have a great variety of shapes, being rod-like, knobbed, anchor-shape or pointed.

These strange organisms hold for naturalists and biologists a fascinating interest that seems never to be deadened.

A Sea Plume from the Bahama Islands.



A Glass Rope Sponge from the Japan Sea.

ADMINISTERS THE LAW WITH WISDOM.

A WOMAN FOR JUDGE

LYDIA BERKELY TAGUE is Judge of the County Court of Eagle County, Col. She is the only woman member of the judiciary in the whole world, so far as the knowledge of man runneth.

Mrs. Tague is not a lawyer, but she is an educated woman along practical lines. It is not necessary in certain counties of Colorado that county judges be lawyers. On the death of her husband, who had held the post for years, she was appointed to the unfinished term. She has been nominated by the Democrats of Eagle County as their candidate in the next election.

At the time of the vacancy, four men applied. The county commissioners hesitated at first to appoint Mrs. Tague, because they feared the naming of a woman would be too radical. They were to learn that their fears were unjustified.

FIRST "MAYORESS" IN WYOMING

THE men of the little town of Dayton, Wyoming, in the heart of the sheep and cattle country, got together the other day and presented the mayoralty to a woman. They did it almost unanimously, too—just fairly put the office on a silver platter and handed it to Mrs. Susan Wissler, who has been town treasurer, and runs a dry-goods store.

This is the first time Wyoming has chosen a woman for mayor.

Mrs. Wissler has lived in Wyoming since 1890. She is a striking looking woman of fifty, with gray hair and with much of the beauty that must have been hers in earlier years. She speaks with a delightful Southern accent and has a rare sense of humor which has tided her over many rough years in the new West. After the death of her husband, sixteen years ago, Mrs. Wissler betook herself energetically to school teaching, finally embarking in the dry-goods business in Dayton. She has two grown children. After her home duties ceased she began to take an active interest in politics.

MAYOR OF DAYTON, WYOMING.

FOUGHT FOR A FORTUNE AND WON

WHEN oil was first discovered in Los Angeles Mrs. Emma A. Summers had $700 in the bank, saved from giving music lessons. With many others she acquired the "oil fever," and with a friend she pooled $1,400 with which to drill. Before the first well was made to yield, an additional $1,800 was expended. Though now considerably in debt, and having no security, she succeeded in persuading a banker to lend her $10,000. She was now alone in her undertakings, and with this indebtedness of over $10,000 to goad her on she sank well after well until success came to offer relief from the strain. During this time she continued to give piano lessons to help pay the bills. At night she kept her books, wrote letters and attended to the other details of the business.

In all, she has bored nearly two hundred wells. She is producing over 1,000 barrels of oil a day. She is even a larger contractor than a producer, and with the oil she buys she supplies contracts aggregating $2,500,000 a year.

OIL AND NERVE HAVE MADE HER RICH.

SCIENTIFIC TEA-TESTING MADE EASY

DEPARTMENT of Agriculture officials calculate that Dr. Alberta Reed, A. B., M. A., Ph. D., etc., will save the government $25,000 in the next year through her almost absurdly simple method of testing tea. When Dr. Reed, a graduate of Cornell University, came to the Department some months ago the government chemist in testing the purity of tea soaked the leaves, and by a protracted chemical process, looked for talc, soapstone or other weight-giving adulterants. Dr. Reed devised a sieve with very small meshes, on top of which she gently shook a few leaves of the suspected tea. The particles of the adulterants, falling on the black or white paper beneath, showed not only that the tea was impure but immediately disclosed to the trained eye just what these impurities were, saving hours of time and a large amount of costly labor and materials. The Department of Agriculture regards Dr. Reed as a remarkable "find."

WILL SAVE THE GOVERNMENT $25,000 IN THE NEXT YEAR.

IT TOOK THREE GUARDS TO WATCH THIS SQUAD IN STRIPES IN THE ARIZONA PENITENTIARY—ONE MAN IN THE GUN-TOWER, AND TWO WITH THE GANG.
Nowadays only overseers are used, and the new system pays in more ways than one.

PICKS POWER FROM THE AIR

By

CHARLTON LAWRENCE EDHOLM

A REMARKABLE scene took place in the legislature of Arizona this spring when the lawmakers enthusiastically voted for the parole of a certain convict in the State penitentiary, granting him a leave of absence for thirty days and by means of private contributions raising a fund to defray his expenses to Washington, D. C., and return.

The prisoner, Roy J. Meyers, is serving a three and a half year sentence, but in spite of the fact that he bears the stigma of a convicted law breaker, he has demonstrated that a convict can be a useful member of society. During his imprisonment he perfected an electrical device of such original character as to arouse feelings of wonder and skepticism until experts had seen it in actual operation. It is a device to draw electricity from the atmosphere for light and power, and the thirty-day parole was granted in order that the inventor might protect his rights through the patent office at Washington.

With the acquiescence of the legislature, Governor Hunt granted the parole and the prisoner was allowed to go free without any guard or any assurance but his word of honor that he would return. Two days before the period had elapsed, Meyers again presented himself before the governor, having accomplished his mission, and then returned to the penitentiary at Florence, where he continues to serve his sentence.

This, in brief, is the picturesque story which has called attention of the civilized world to a newly discovered electrical genius, and to another feature of the case which is of equal importance and human interest; namely, the enlightened policy pursued by our youngest State in its treatment of convicts.

Meyers' chance came when Governor George W. B. Hunt chose as superintendent of the penitentiary at Florence a man of very different type from the political hanger-on who too often fills such a position. "Big Bob" Sims was a business man of advanced views, and was chosen for the position because of his knowledge of human nature and his executive ability.

One of the progressive steps he took was to abolish the stripes in the penitentiary, and to adopt a much less rigorous confinement of the inmates. The "honor

system" with the co-operation of Governor Hunt, was inaugurated.

Before entering the prison, Meyers had already applied for various patents, among them one for an improved trolley head which prevents the trolley wheel from jumping the wire. Meyers had a conference with Superintendent Sims and Parole Clerk Sanders, and it was to these gentlemen that the inventor first explained the principles of his new device for securing electrical energy from the air. The officials were willing to give the man an opportunity to develop his plan and a little wooden building outside the walls was turned over to Meyers and was fitted up as a workshop and a laboratory. The first demonstration of the new apparatus was made shortly thereafter, the electricity drawn from the atmosphere being used to spark the gas engines of the pump house, and although the device was crude yet it did the work, and removed the doubts of his friends. Further development of the "absorber" followed, and his second model was constructed, and developed eight volts. The machine came to the attention of the remarkable woman who brought his name before the legislature.

This was Miss Kate Barnard, State Commissioner of Charities and Corrections of Oklahoma, who was a guest of Mrs. Sims, while studying prison conditions. She saw the machine at work, became familiar with the facts of Meyers' case, and was impressed by his rather blunt and unaffected personality, for Meyers has nothing of the polish or glibness of the *poseur*. He is a simple, earnest student of mechanical problems and not the sort of a man to make a sentimental appeal for sympathy because of any grace of person or manner. Therefore it was the value of Meyers' invention, together with his essential integrity (in spite of his lapse) which so strongly impressed Miss Barnard that when she appeared before the Arizona legislature not long afterwards, addressing that body on the need of enlightened legislation along the line of her own work, she told the story of Roy Meyers and his epoch-making invention.

So, early in May, Meyers set out for Washington, unaccompanied.

In his own words: "When I arrived in Washington and laid my plans before the patent office experts, they merely smiled and told me that I would have to build a model and demonstrate my claims —that it seemed strange that I, unknown as I am to the electrical world, should have accomplished the things for which Edison, Tesla and other experts have been striving for years.

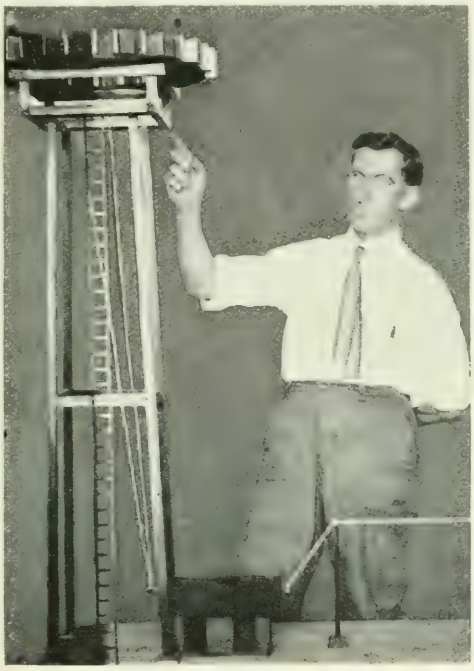
"They could not grasp the meanings of my drawings nor the explanation I tried to make to them. There was little time to spare, as I had only twenty days left of my leave, but I set to work and in a few days was able to take a crude model around to the patent office to make a demonstration.

"Arriving at the patent office I telephoned to a friend who had been so

MISS KATE BARNARD, STATE COMMISSIONER OF CHARITIES AND CORRECTIONS OF OKLAHOMA, WHO APPEARED BEFORE THE ARIZONA LEGISLATURE IN A PLEA FOR MEYERS.

kind as to introduce me and aid me in reaching the proper officials. The absorber was hoisted on two short poles and made to work. While they were as yet unable to understand the principles involved and hardly willing to believe their eyes, they were forced to admit that I had something new and different, and they told me that there would be no further objection; that I might file my application without further delay.

"I hope to construct my first large machine right here in Phoenix. I feel grateful to Governor Hunt and others for what they have done for me and for the help they have given in securing protection I might not otherwise have had, and I am desirous of demonstrating this gratitude. I am going back to Florence today to resume the serving of my sentence, which will expire in ten months. Then, here in Phoenix, I will begin the work of making my machines."



ROY J. MYERS THE ARIZONA CONVICT-INVENTOR, WHO WAS PAROLED FOR THIRTY DAYS WHILE HE WENT TO WASHINGTON TO SECURE A PATENT.

THE STATE PENITENTIARY AT FLORENCE, ARIZONA, WHERE MEYERS IS IMPRISONED.

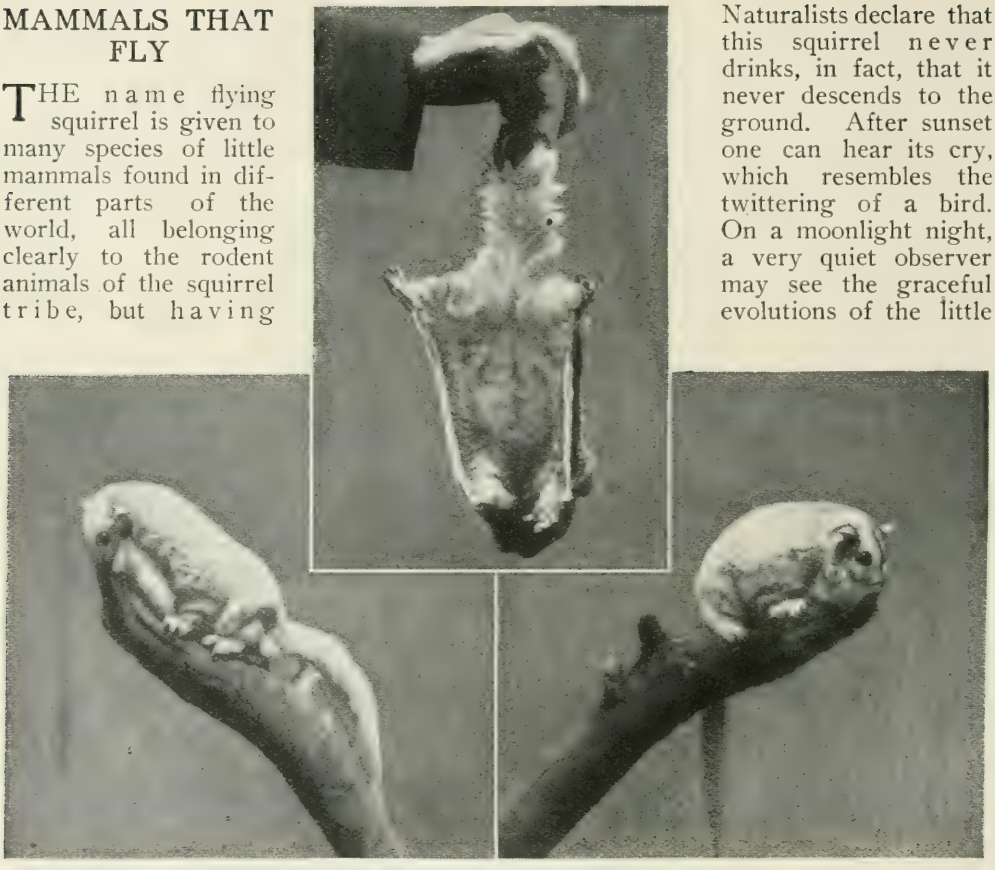
While there are some details of the device which the inventor refuses to make public, yet there are many general features that may be explained. It is planned that the machine, to be set up in Phoenix, will generate sufficient power to light that city, and will consist of a two-hundred foot tower upon which is placed the "absorber." The latter consists of a series of magnetized steel plates set in a circle, (the manner of preparing them is kept secret) and this mechanism attracts the electricity from the atmosphere. This is carried by wires to a transformer in the engine house below and thence is applied to produce either power or light after the usual manner.

In an authorized statement Meyers says: "The flow of electricity is constant. When it emerges into the transformer it is in the form of a direct current. It will absorb the electricity night and day and will work whenever the wireless will work. I can put up a plant to light such a building as the Adams Hotel for about one thousand five hundred dollars, and one of the principal items of expense is the cost of the towers, the wires, and the magnetizing of one set of plates, which is part of the secret of the treatment which makes it respond to the accumulations of the atmosphere.

"For use in the case of an electric storm I have made what I call a modified form of circuit breaker, such as is commonly used as a lightning arrester on telegraph lines. In case of a storm the accumulator would become suddenly overcharged, possibly, and as the electricity would not of itself flow back into the air, the result might be disastrous. So I send it down into the ground, whenever the voltage rises above a certain amount."

MAMMALS THAT FLY

THE name flying squirrel is given to many species of little mammals found in different parts of the world, all belonging clearly to the rodent animals of the squirrel tribe, but having scarcely any point of resemblance except the existence of a membrane which extends the skin from the flanks and performs the functions of a parachute.



THE FLYING SQUIRREL OF AUSTRALIA.
The photos at right and left show favorite postures of the animal. Above is seen the membrane "parachute" of the little animal.

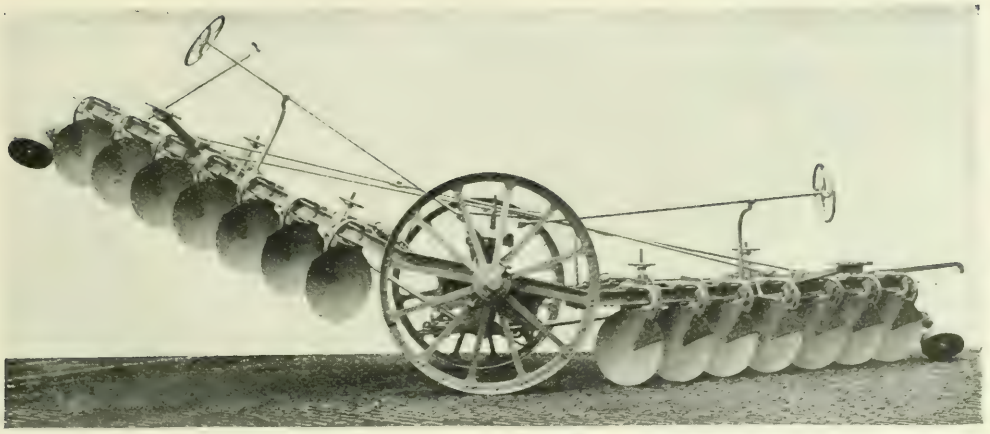
The curious flying squirrel of Australia dwells in trees, seeks its food at night, and feeds on insects, berries, and the eggs of small birds.

It has a fleecy fur of whitish grey tinged with red. Its long bushy tail with prehensile extremity serves as a rudder when it flies from one tree to another, and also enables it to cling to the branches while having free use of its feet. It has a ventral pouch for carrying the immature young.

It is almost impossible to study the manners of this nocturnal animal, so we have a limited knowledge of its habits. It passes the entire day in its nest, a hole dug in the top of a tree. Naturalists declare that this squirrel never drinks, in fact, that it never descends to the ground. After sunset one can hear its cry, which resembles the twittering of a bird. On a moonlight night, a very quiet observer may see the graceful evolutions of the little creatures fluttering in the air. They spring from the top of a tree and by stretching their four feet extend the folds of the membrane. The strange parachute slackens the descent and the squirrel lands on a branch without the slightest shock to it as a result of its leap through space.

Observers do not agree on the maximum flight of these animals, but it appears to have been proved that they can fly a distance of from seventy-five to one hundred feet, though some claim for them a much greater distance. It is quite possible, of course, that various ones of these animals may vary in their leaping capacity.

Like all nocturnal mammals, they do not thrive in captivity, even in their native country, and therefore one rarely sees them in zoological gardens.



SOMETHING UNUSUAL IN AGRICULTURAL MACHINERY.

The photograph shows a new plough designed to turn up seven furrows at one operation. There are seven blades at each end, so that the plough is drawn first one way and then the other, the two sets of blades being thus used alternately.

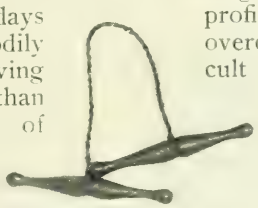
MOVING A HOUSE ON WATER

THAT navigation should be included in the education of a house-mover was demonstrated recently in Chicago by a real estate dealer, who saved several hundreds of dollars and many days of time by loading a house bodily on pontoons and barges and having it towed a distance of more than three miles over the waters of Lake Michigan to its new site.

The buyer of the house found it unsalable in its former location. He therefore laid his plans to move it to another location three miles distant, but found it would cost more to transport the house by land than it would be worth when it was moved. He therefore decided to make use of the lake, and although experienced house movers tried to discourage him, he figured that he could do so and still make a profit.

In order to get the house onto the barges and scows on which it was to be towed along the lake shore, it was necessary first to build a pontoon bridge, and this operation had to be repeated when, an hour after the start was made, the house hove to the off-shore site where it was to be landed. Fortunately there were no squalls or other weather disturbances to interfere with the work, for which there was required less than seven hours' time.

The expense of moving was less than $1,000, and the owner estimates that in its present location he will have no difficulty in selling the property at a handsome profit. Thus, by ingenuity, he overcame an apparently very difficult problem.



A RELIC OF THE BARBARIC PAST.

Old-time "nippers," used until recently in the rural districts of Pennsylvania. They have been superseded by the modern "handcuff." "Nippers" were placed around the wrist of a prisoner and twisted.

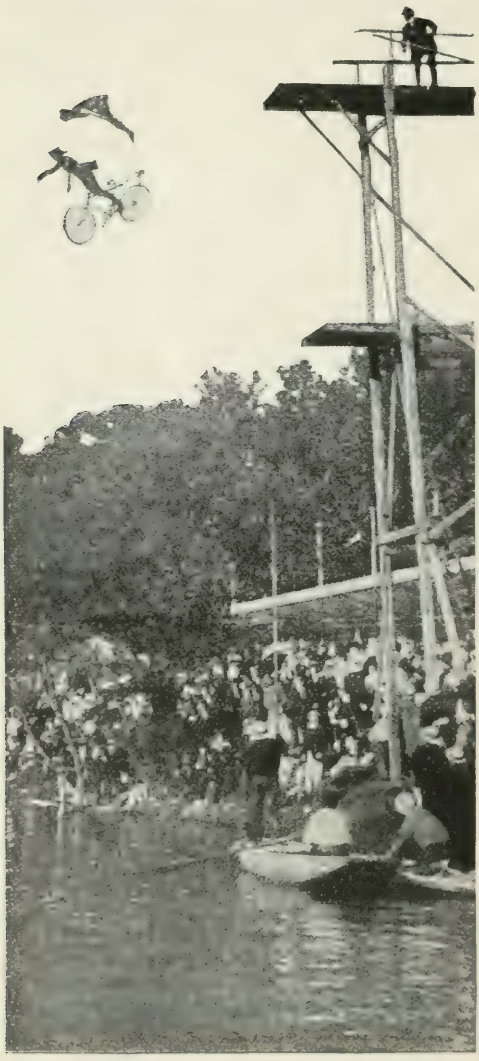
DANGEROUS ACROBATICS

ONE of the most perilous acrobatic feats is that lately performed by Léonce Sudra, in Paris, whose specialty it is to pose for cinematographs. Six years ago he made the wager that he would jump with feet joined together from the rampart of the fortifications at the Porte of Saint Ouen, the distance of this jump being about thirty-two feet. The attempt was made but the man was

HOUSE TOWED THREE MILES OVER LAKE MICHIGAN.

SUBSTITUTE FOR BOAT LOCK.

This substitute for a boat lock is in use in northern Wisconsin, where pleasure boats pass from Tomahawk Lake to a small canal which is on a higher level. In going from one to the other, the boat is supported in a saddle and rests upon a small truck that runs upon an inclined track, beneath the water on either side, so that the vessel can easily float into position over the saddle. When this has been accomplished the truck is then drawn to the top of the incline by means of a rope and the windlass shown at the right, under the first illustration. The second illustration shows a view of the canal beyond the dam.



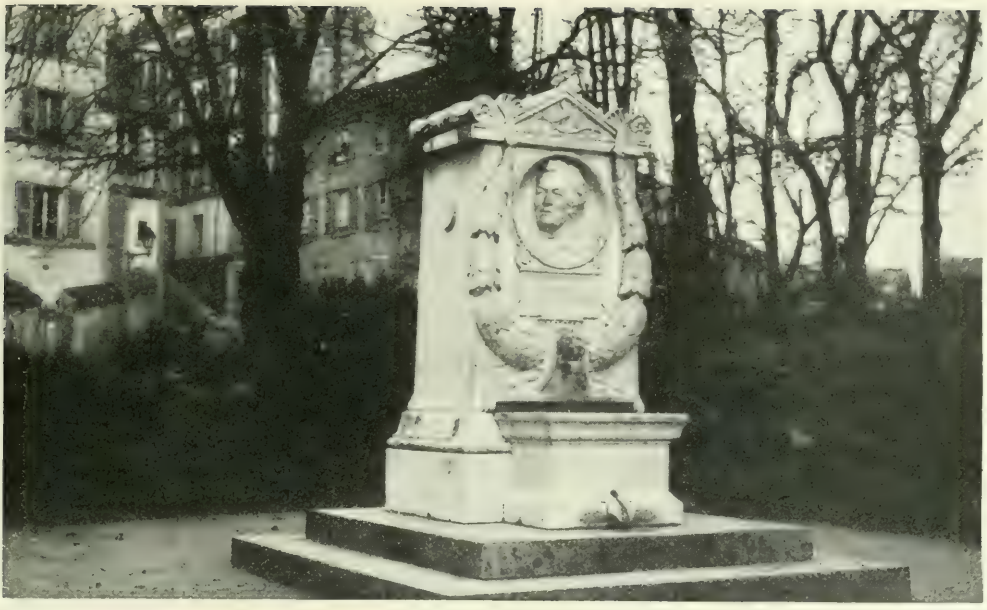
A MOST REMARKABLE TANDEM DIVE

seriously injured and confined to a hospital for several months. On his recovery he tried again and succeeded perfectly.

Another extraordinary performance was the leap on a tandem by Peyruson and Mme. X, as the woman called herself. They jumped into space on the machine and left it at a short distance from the water into which they descended without dangerous results.

Schreyer, known as the dare-devil, did a similar thing. He had prepared a platform, the plane of which inclined about forty-five degrees and which was three feet wide. At the end this plane was raised. Schreyer rushed on his bicycle the length of the platform at full speed till the elevated board precipitated him into the air. The acrobat then made a thrilling leap, letting the bicycle fall into a net while he dropped into a deep pool of water.

Schreyer has performed, on various occasions, similar daring feats. He has, indeed, been seriously injured on more than one occasion, by being struck in the water by his bicycle as it plunged after him. In spite of these accidents, however, his nerve has remained unshaken, and he has repeated his hazardous act again and again.



UNUSUAL PLACING OF A STATUE

FEW of the French modern statues and monuments lack poetic touch and setting. A good example of the point is the statue to Corot, the painter, in Ville d'Avray, a little town on the road from Paris to Versailles. The monument was placed in a miniature park by the edge of a pond; the stone face of the artist gazes forever at the changing lights and ripples and the framing branches of a scene he loved to paint.

A ROADSIDE TELEPHONE SERVICE.

Sentry boxes, with a telephone attached, are being erected by the Automobile Association and Motor Union of England at intervals along most of the main roads for the use of members. This enables a motorist, whose machine has broken down on the road, to telephone to the nearest A.A. and M.U. repairer for assistance and to his home to explain the cause of delay, thus saving much worry to both the motorist and those awaiting him.

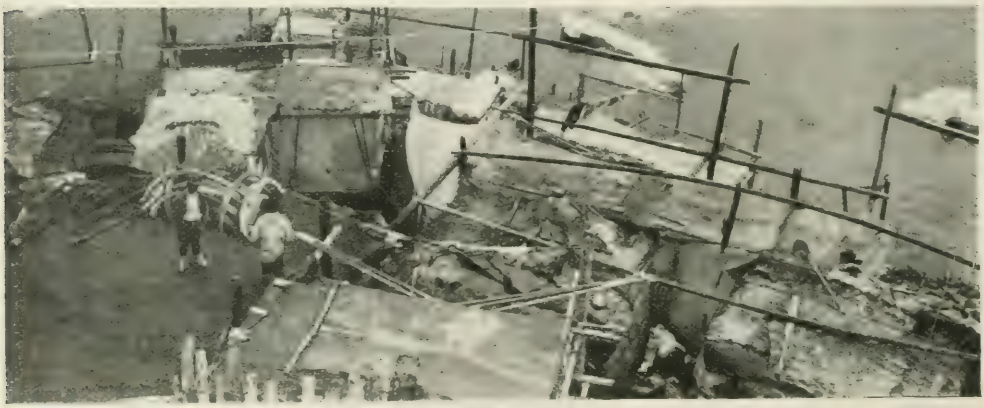
A WALRUS-HIDE VILLAGE

ON King's Island, north of Nome, near Cape Prince of Wales, Alaska, and not very far from the Arctic Ocean, wood is valuable and walrus are cheap. The fifty or sixty Eskimo who make this rocky, barren bit of land their home most naturally make use of the walrus wherever any part of the beast comes in handy. Among other things they build their homes of walrus hide.

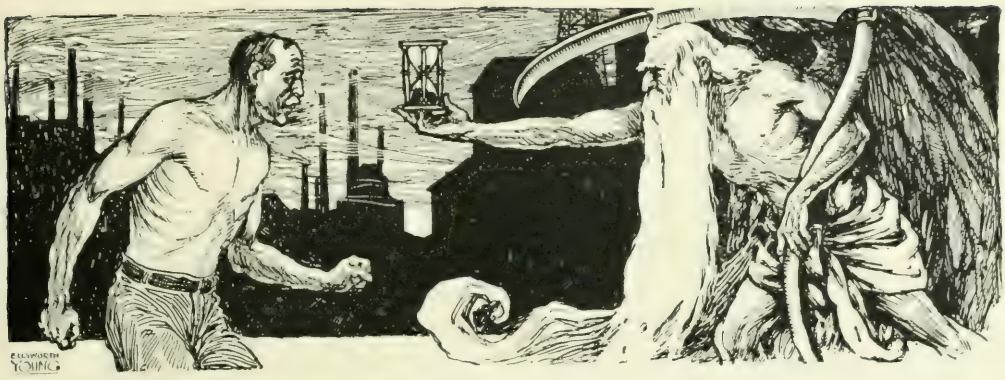
A curious huddle of houses and igloos is King's Island village, long legged homes that present the appearance of a company of huge ostriches straggling down a hillside. The village shelters under the rocky cliffs out of the winds of the North and from some points of view is reminiscent of a cliff dwelling community.

Each house stands on long legs of timber to keep its floor at right angles to the cliff at the back. A framework of timber, drift wood and hoarded scraps of board, supports the walls which are of split walrus hide. The nearby floes from the Arctic supply plenty of this building material in the raw and the natives go out in kayaks and, nowadays even in gasoline power schooners, to do battle. The walrus hide gives a waterproof and windproof shelter.

A few of the King's Island natives prefer the underground igloo as a dwelling. The entire community usually removes to Seward peninsula in mid winter. The Eskimo are friendly and industrious.



THE WALRUS-SKIN VILLAGE.



MEN AGE TOO QUICKLY.

STANDING OFF FATHER TIME

By

F. C. WALSH, M.D.

WHILE some few world-scattered scientists are racking their brains in an endeavor to make the span of life stretch to the "century mark," an equally scarce number of statesmen are spending an occasional half-hour in planning ways and means for the betterment of those whose lives, industrially considered, seem already too long by far,—those unfortunates who are economically unfit and helpless at sixty; yes, and even as early as fifty and forty! For in spite of the fact that we have succeeded in adding a few scant years to human life, the average man is now actually less efficient, from an industrial and military standpoint, at a much earlier period of life than was formerly the case.

Men age too quickly. Under present industrial and social conditions their working span as measured by years is not long enough to enable them, even by rigid economy, to lay up enough for that day of decrepitude which is as sure in its oncoming as the equally inevitable taxes and death. In a group of figures covering a period of five years in the city of New York, and to the great astonishment of those who compiled them, over eighty-six out of every hundred adults who died in that period left no estate of any kind whatsoever. They didn't leave so much as a dollar, and these people weren't paupers, either! In the fierce competition of today, the man who is not a capitalist has to stand off old age with all the resources he can bring to his command, or else go under in the bitter industrial struggle.

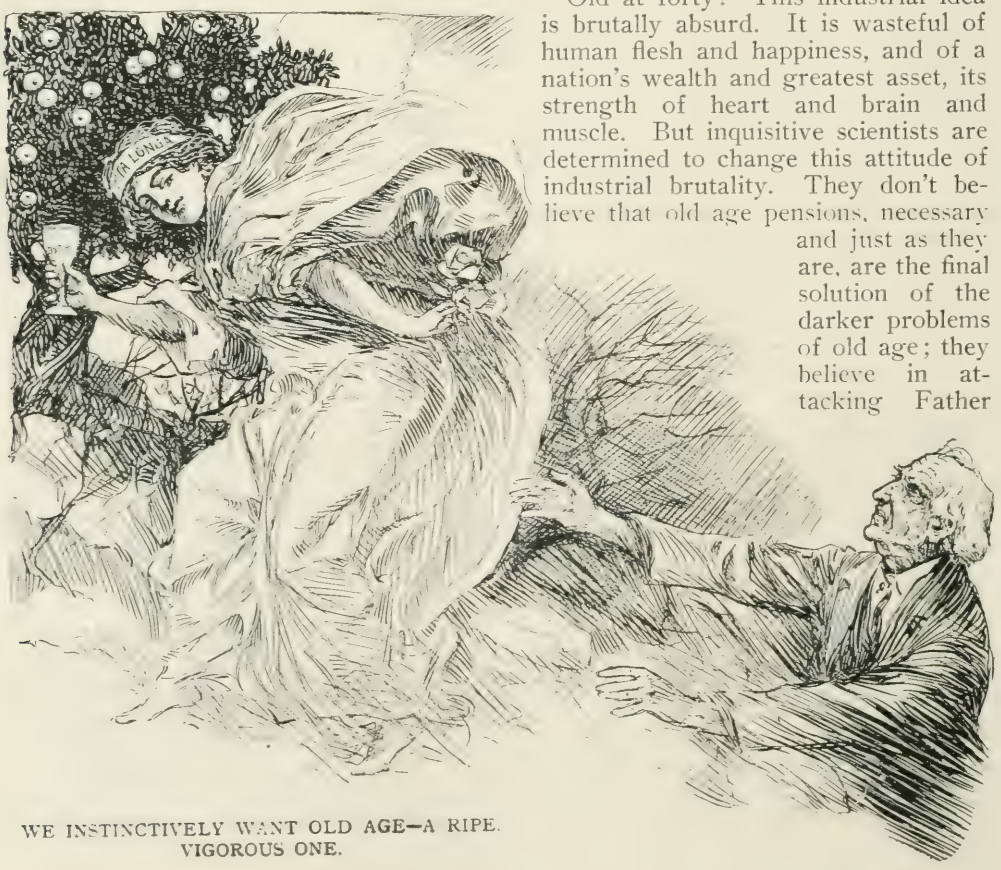
Individually, we instinctively want old age, a ripe and vigorous one, and if science can assist us in bringing this about, it will have aided in solving a serious economic problem, besides satisfying a natural, human longing. Efforts to ward off the ravages of time aim at two things: life for its own sake, and the extension of the period of economic and industrial efficiency to at least three score and ten, and possibly to four score of years or more.

From the purely selfish point of view, the problem is an old one, and if ancient editors can be relied on, and Methuselah solved the matter to his own satisfaction, he certainly carried the secret with him across the Stygian stream. But there are many short cuts through the problem, at least in its sociological aspects. Dr. Osler, of jestful memory, would employ

heroic measures and chloroform all who ventured near the threshold of Father Time. And the barb of careless jest is often winged with approximate truth, for even in civilized countries the number of aged who are murdered just because they are aged, or who commit suicide for the same reason, is a cruel outward expression of a hidden feeling that old people are useless and in the way. I said this is true in "civilized" countries, disregarding the fact that the stage of civilization of a nation may be measured by the care it bestows upon its aged.

But Dr. Osler and our various civilizations are a little bit late in their jestful proposals and homicidal activities. Down below Patagonia, in the volcanic "Land of Fire," the savages for centuries have nicely met the problem by judiciously killing off all of their tribe who are too old to hunt or fish. Imperial Germany,—monarchial, and therefore unjust and cruel in the minds of many,—has faced this aged issue by paying its old and helpless an annual life-supporting pension. England, with that stalwart progressive Lloyd-George fighting in the van under the banner of his sainted namesake, has courageously attacked this economic dragon and wisely followed Germany's lead. Here in America the problem has never become acute as a public issue, but it is an incontrovertible fact, and an outcome of recently developed industrial conditions, that the man over forty,—mind you—and "out of a job," usually experiences difficulty in securing permanent employment, and stands the smallest chance when dealing with our corporations. And the employer is right,—if he looks on the men he employs as so many human engines, to be used up as he needs them, and thrown into the scrap heap only to be replaced by younger ones capable of returning him so many horse-power at so much on the dollar.

Old at forty! This industrial idea is brutally absurd. It is wasteful of human flesh and happiness, and of a nation's wealth and greatest asset, its strength of heart and brain and muscle. But inquisitive scientists are determined to change this attitude of industrial brutality. They don't believe that old age pensions, necessary and just as they are, are the final solution of the darker problems of old age; they believe in attacking Father



WE INSTINCTIVELY WANT OLD AGE—A RIPE, VIGOROUS ONE.

Time himself, and force him to loosen his grip, until the man in the seventies,—or even the eighties—will have some sort of a chance in the great competitive industrial struggle which, instead of nearing its end, has only just begun. These optimistic scientists have reasons for hope.

If no one had ever passed the "allotted" three score and ten,—a silly phrase, by the way—these hopes might appear absurd and unfounded. But if France alone can produce over a hundred and fifty living evidences each year of persons who have passed the century mark of years, there is every reason to suppose that the average man can attain an equivalent number of years. People don't live to be a hundred by mere accident, there is a reason for everything if it can be discovered. In Greece, a very small country, over fifteen hundred people are reported to reach annually the age of a hundred years or more, while the number of centenarians in Bulgaria and Roumania is almost as great as the number of men in Massachusetts and Illinois who feel they have done well to reach the age of seventy.

There are conspicuous instances of individuals who have lived far beyond the century mark. Take the case of one Drakenberg, a Norwegian sailor who followed the seas for ninety-one years, and then, becoming tired of a sea-faring life, retired to a fishing village, where he stubbornly held on to life until he was a hundred and forty-six. In Hungary, a farmer named Pierre Zornay superintended his crops until he died at the age of one hundred and eighty-five. Thomas Parr, an English peasant, worked hard until he was a hundred and thirty, and then continued to live until he reached a hundred and fifty-two. This instance was vouched for by Dr. Harvey, the eminent discoverer of the circulation of the blood. He examined old Parr's body after death, and could find no traces of any organic disease. Just there lies an important point. Scientific hopes are based on the fact that if we can escape the accidental diseases of life, such as pneumonia and tuberculosis, and that by following a special course of regime planned for the sole purpose of arriving at a vigorous old age, there will be no reason to doubt that the average person will live to be a hundred, at the very least.

Neither a wonderfully endowed constitution nor heredity explains such instances as that of Thomas Parr, though he left a son who attained the ripe age of one hundred and twenty-seven, retaining all his mental faculties to the end. But environment and the same habits and mode of living would seem to count for more than anything else. All through Europe, and particularly in eastern Europe, old couples are numerous, and the fact that two very old people attain old age together, even when their parents died young, eliminates the heredity factor, and points very strongly to habit and dietary influence. And why not? In the plant world the sturdiest of seeds will not thrive so well as weaker ones which have the advantage of being sown on well-fertilized ground; the food we eat is nothing more than so much fertilizer for the millions of minute cells of which our bodies are composed.

If, judging by these instances, life can be prolonged, how long should a man live? The answer comes from our friends, the brutes. Among the lower animals, the natural length of life bears a certain fixed relation to the number of years required to reach maturity. In most instances, animals live to be five times that maturing period. In man, maturity is reached at twenty—this is based on bone development—and as there is no valid reason for excluding man from the working of a general biological rule, man should live to an age just five times his period of development, which, multiplying twenty by five, is exactly one hundred years. Whoever started the theory that man's allotted years are three score and ten, it will be seen, has for ages been robbing human life of thirty good, desirable years. It takes sixty years to learn how to live.

Granting then that man is right in his instinctive desire to reach a healthy and useful old age; admitting also that it is a serious economic problem, and likely to become more and more acute in the oncoming industrial decades in its relationship to such artificial devices as old age pensions,—wise though they be at the present time—how is a man to set

about to prolong his years and efficiency?

Of recipes, unpublished for the most part, there is no end. Every man past seventy cherishes at least one, based on his own personal and therefore narrow and limited experience. Unfortunately any two of these are seldom alike, and more often than not absolutely contradict each other. Especially is this true of that well-intentioned advice given by those whose minds are not trained to scientific methods of observation and deduction. But if one man attributes his unusual length of years to the eating of garlic, or plum-pudding, or anything your fancy wishes to fill in; while another of equal length of years attributes his age to just an opposite course, neither is to blame or is open to ridicule, for even science itself is having a hard enough task in dealing with every phase of the problem. But much is scientifically certain; a good deal nearly so; and more is being gleaned.

One who has reached the age of forty or forty-five, and in good health, may abuse that health as much as he or she pleases, and still live to be sixty or sixty-five. Contrariwise, one may be careful and temperate in all things; one may avoid everything injurious, religiously follow all general rules for the preservation of health, and still never reach a sound old age. This sounds more discouraging than it really is.

In the first place, anyone contemplating entering the race with the object of reaching the goal of old and efficient age, should begin his endeavors not later than forty, and certainly not later than his fiftieth year. There are special perils in the "fifties," and most of what follows applies with special force to that period. But barring accidents,—and by accidents we include and mean such common affections as pneumonia, etc.,—one who has safely rounded the stormy cape of the "fifties" should be able, by persisting in following certain definite and specific rules, to attain the scientific time allotted to man's years,—not the traditional score and ten—but a well filled and rounded out century.

Science often confirms the truth of many old sayings. That "a man is as old as his arteries" is the last word of science as well as the current expression of common hearsay. Old arteries are literally "hard" arteries, brittle and shrunken in calibre; young arteries are "soft" and elastic. This difference is due to the difference in amount of "fibrous" tissue contained in the two kinds of arteries, the hard or soft. This fibrous tissue, which is found in the principal organs of the body, is the skeleton-work, so to speak, of these various organs. It bears the same relation and purpose to the organ of which it is the frame-work, that the wax in a comb of honey bears to the honey-containing cells. Any increase in this fibrous tissue, whether it be in the liver, kidneys, or arteries, is sure to cause serious trouble sooner or later because of the "hardening" it undergoes. Useless in itself except as a frame-work, any material increase in its quantity interferes with the proper working of the body cells in its immediate vicinity, limiting their nourishment and endangering their very life. So that speaking literally as well as scientifically, a man is old or young not so much because of his years in numbers, but according to whether or not he has an abnormal or excessive amount of "fibrous" tissue somewhere in his system. This excess generally manifests itself first in the arteries, as an outward expression of "hardening" in other tissues. Consequently a man with "soft" arteries at seventy is literally still a youth; while a man of forty with hardened arteries is to all intents and purposes a man of sixty-five or seventy, excepting always intellect. The immediate cause of old age, then, is an increase of the body's "fibrous" tissue, which, by reason of its very excess, encroaches on the bounds of the soft, delicate cells whose functions are so important that they constitute the very essence of life. By this constant encroachment for a long period of time, these vital, essential life-cells are squeezed and twisted and starved until they can carry on their work no longer.

But what causes this unnatural increase of "fibrous" tissue? In the answer to that lies the whole secret both of the prevention of an "early" old age, and the prolongation of life to the limits propounded by science.

There is one main cause which is no respecter of persons, and is constantly

operative in all of us, as will be shown in detail a few steps further on. It is most closely related to the problem of defeating Father Time. To a more limited extent, though of great importance, the chief things which harden the arteries and other tissues, and obtrude on the life of the body cells, are meat-eating, alcohol, and that monstrous social disease which false modesty and hypocrisy decree shall not be mentioned except in a whisper or in medical books. But, if the ravages of this horrible disease were oftener openly referred to, and therefore more widely understood, the necessity of mentioning it would become proportionately less frequent. However, we repeat, old age is brought on prematurely in the case of hundreds of thousands of individuals as a result of this disease, and with that none too emphatic statement, dismiss it from further discussion.

The eating of meat of itself would not be of such great importance as a causative factor if it were not for the injury it does indirectly. For unquestionably, meat-eating is one of the principal causes of alcoholic addiction, though its importance in this respect has been too long ignored. Dr. Jakon, a European authority, has demonstrated this truth by a beautiful process of logical reasoning, but at too great length to present in detail here. His conclusions go even farther: "The remedy for a l c o h o l i s m," he tersely states after a keen analysis, "is to be found in vegetarianism." And just because of its importance in connection with the use of alcohol, and the great role the latter plays in "hardening" the arteries, stress must be laid on the necessity of avoiding meat-eating entirely or as much as possible after the age of forty.

Man is not naturally, or certainly not necessarily, a meat-eater any more than is his cousin the monkey. The fact that man has two teeth on each jaw adapted for tearing flesh to shreds proves nothing to the contrary. "But," as M. Leclercq of the French Academy says, "man is the King of creation, and by a return of atavism and original savagery of which the struggles between the peoples of the earth are still a strange but real vestige, he delights in orgies of the flesh. Not satisfied with borrowing protection and covering from his inferior brothers, the lower animals, man, having used up the wool, then eats the sheep, and always knows, at the banquet of Nature, how to keep in reserve a sharp tooth for his only match, his fellow-man." This may be sentiment. But sentiment aside, and

OLD AT FORTY! . . . INQUISITIVE SCIENTISTS ARE DETERMINED TO CHANGE THIS ATTITUDE.

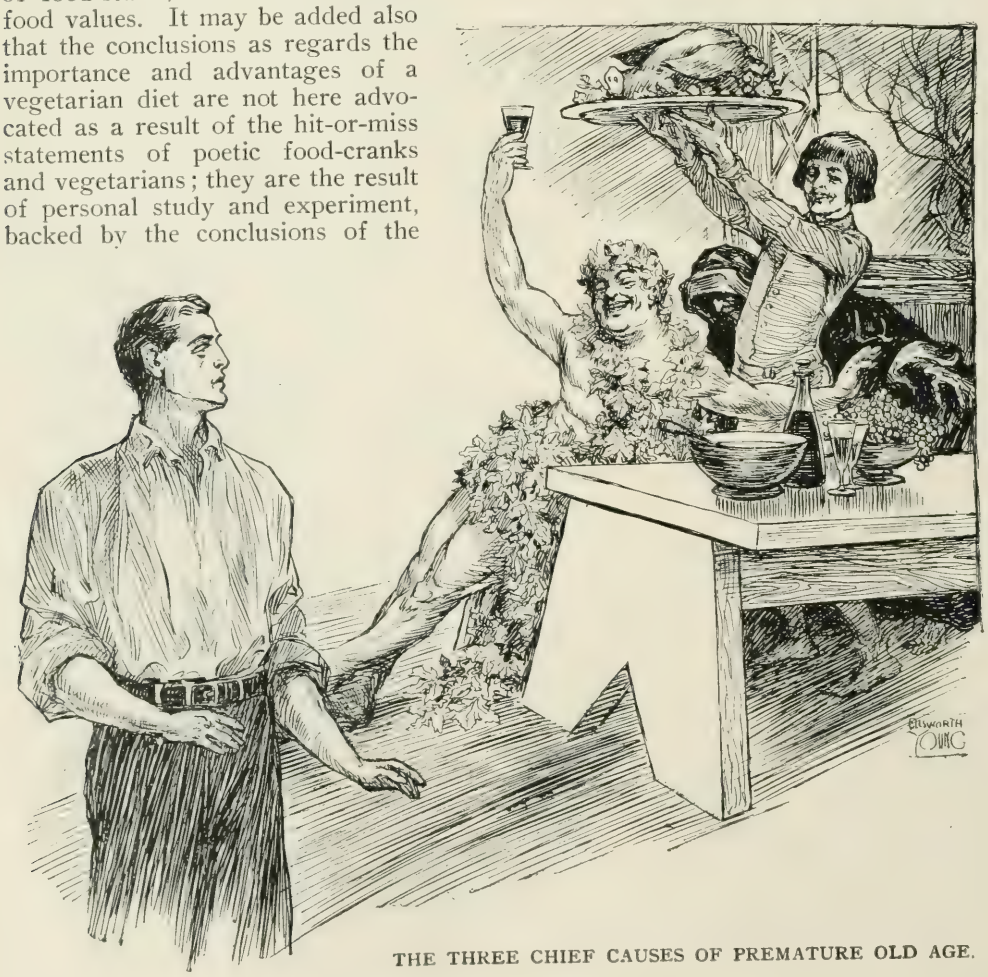
on purely scientific grounds, a vegetarian regimen must be recommended and insisted upon, if one wishes to enter the old-age Marathon with any prospects of winning. An interesting point in this connection is the comparative cost of various diets. On a scientific basis of right living the comparative cost is as follows:

An all-meat diet	$2.00
A semi-meat diet	1.25
A vegetarian diet, with milk and eggs	.60
Exclusive fruit diet	1.30
Exclusive vegetable diet	.40

The above figures are not drawn from the spasmodic attempts of club-women's socials in their endeavors to demonstrate the "low cost" of living, but are taken rather from an international average cost of food-stuffs, with their scientific food values. It may be added also that the conclusions as regards the importance and advantages of a vegetarian diet are not here advocated as a result of the hit-or-miss statements of poetic food-cranks and vegetarians; they are the result of personal study and experiment, backed by the conclusions of the highest scientific experts of France and Germany.

But a man may avoid alcohol; he may turn vegetarian; he may be absolutely free from all suspicion of that monster blithely termed "Social" Disease,—and still not be saved for the efficiency of a ripe and joyful old age! For that reason we must hurry,—a bad thing, by the way —to a consideration of the one great factor which is constantly operative in bringing all of us nearer the uninviting threshold of Father Time. That factor is the portion of the large intestines which lies in the vicinity of that dangerous neighbor, the appendix.

An animal lives long in proportion to the length of its large intestine. To put the matter diagrammatically and not literally, so to speak, an animal's length of



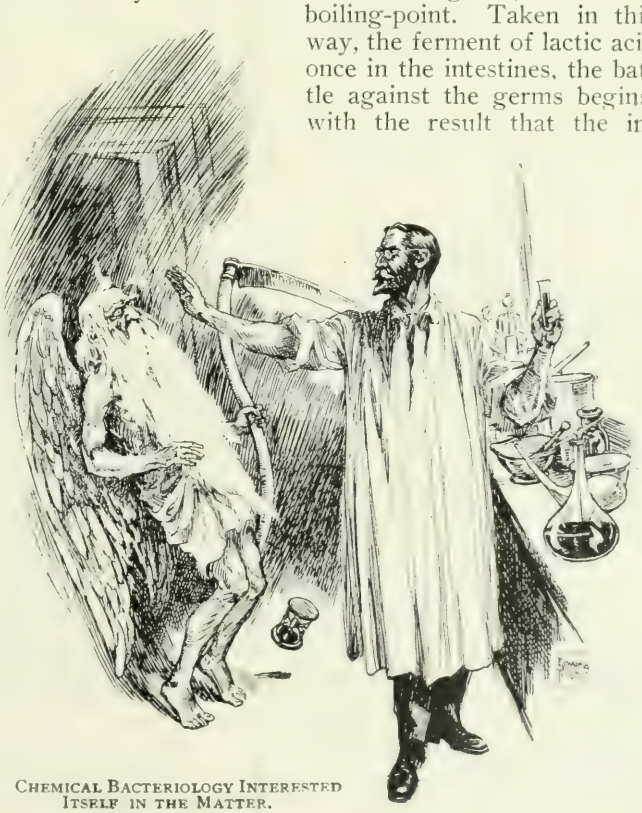
THE THREE CHIEF CAUSES OF PREMATURE OLD AGE.

life is in inverse proportion to the length of its large intestine. In other words, and for purposes of illustration, it may be said that an animal with a double-length intestine lives just half as long as it would with an intestine just half the length of the one it is unfortunate enough to possess. Man is no exception. But this of itself would be of no importance whatever in its bearing on the subject of long life. It is the "germ of old age," harbored in this intestine, which really counts. That is the kernel of the whole problem.

Now that we have arrived this far, it must be said at the risk of committing an Irish "bull," that there is no "germ" of old age, or at least no such germ has been "spotted" by the microscope as being the one particular offender. But, —and this much is certain—there is a whole group of "flora," or germs, which infest the large intestine of man and other animals. These were formerly considered innocent and harmless, though it is now known that they manufacture a poison which, becoming absorbed by the blood-stream and acting on the body-tissues for a long period of time, increases the "fibrous" tissue of the arteries, "hardens" the fibrous tissue of various organs, and brings on either premature or so-called natural old age. Bearing this fact in mind, it will be readily understood that the longer the intestine, the greater will be the number of these germs at work, which brings us back to the former statement, "the longer the intestine of an animal, the shorter its life."

This phase of the problem manifestly sifts itself down to this: either to get rid of the large intestine by surgical interference, or else get rid of these "germs of old age" by destroying them with some sort of germ-killer. The former course is obviously out of the question. Efforts to succeed in the latter, by means of chemical agents, have proved futile, for if used in sufficient strength as much damage is done to the lining of the intestine as to the germs themselves.

Such was the stage of the apparently impossible problem until chemical-bacteriology interested itself in the matter. Then, with one of those wild flights of fancy of which science is capable, in spite of its supposed dry prosiness, the idea was conceived of setting some one kind of germ to fight and destroy these "germs of old age." It was a brilliant idea, and after much patient and persistent experimenting, a valuable ally on the side of man was discovered in the minute yeast-like ferment which causes milk to sour. This sour-milk ferment is technically known as lactic acid. It is the vital factor in the manufacture of butter and cheese. In a crude way it may be taken into the system in the form of butter-milk and "cottage-cheese," but on grounds of purity, the lactic acid itself, in tablet form, may be taken; or, best of all, a lactic acid tablet dissolved in fresh milk which has been brought close to the boiling-point. Taken in this way, the ferment of lactic acid once in the intestines, the battle against the germs begins, with the result that the in-



CHEMICAL BACTERIOLOGY INTERESTED ITSELF IN THE MATTER.

jurious ones are soon forced to beat a retreat, and for every hour of battle, a month or more is added to the life of man. Once in possession, the lactic acid ferment remains in possession without doing injury to its surroundings, and requires addition to its forces only two or three times a week.

To those, then, who think life such a good thing that it should be prolonged as long as possible, the directions are few and simple: Follow general rules of health as closely as able until the age of forty. When that age is reached, continue to follow the general health rules, but besides this, avoid eating meat as much as possible; abstain from alcohol; avoid constipation as you would the plague; and last but not least, get plenty of lactic acid into the system, either in the form of butter-milk, "cottage-cheese," lactic acid tablets, or best of all, sweet, heated milk treated with lactic acid in the manner already mentioned. If, after following this regime faithfully, and the "century mark" is not attained, it will not be because you are to blame, but rather because, in spite of the fact that science has told all it knows, there is still some missing link—the link of vital importance—in its theory of old age and its methods of reaching it.

Thoughts from Emerson

¶ By necessity, by proclivity, and by delight, we all quote.

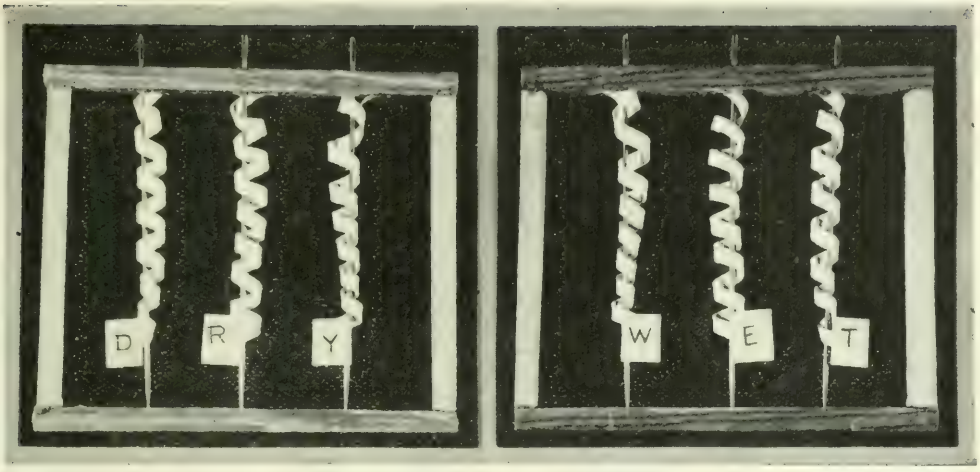
¶ Nothing great was ever achieved without enthusiasm.

¶ Discontent is the want of self-reliance: it is infirmity of will.

¶ We do not count a man's years until he has nothing else to count.

¶ It is as difficult to appropriate the thoughts of others as it is to invent.

¶ The passages of Shakespeare that we most prize were never quoted until within this century.



AN INGENIOUSLY DEVISED BAROMETER.

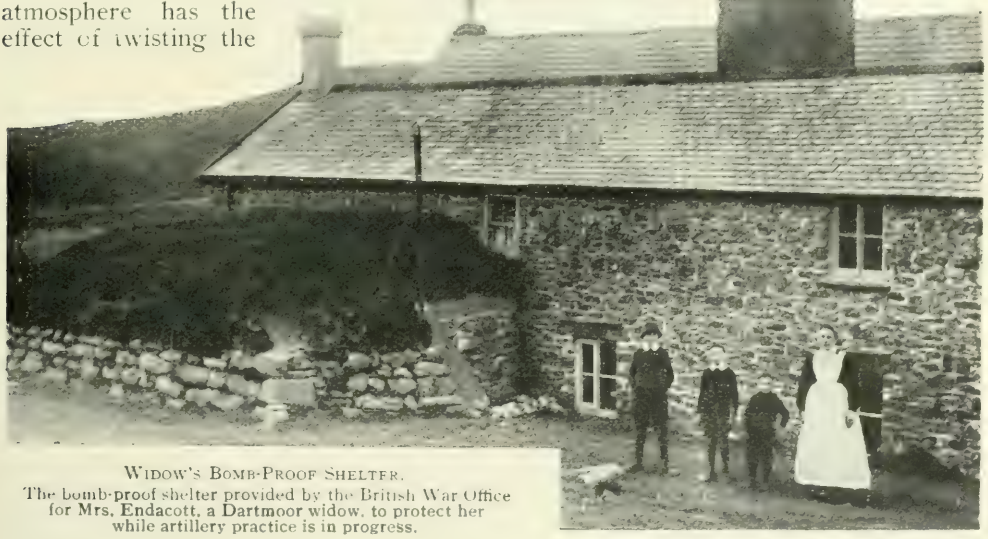
BAROMETER MADE BY SCHOOLBOY

THIS little instrument is remarkable for its simplicity as well as for its practicability. It is composed of a small wooden frame with three large darning needles piercing the top bar and the points embedded in the lower. Around these are twisted three spiral curls of metal foil fastened at the top but free at the bottom. At the extremity of each loose end is fastened a small square of paper. On one side of these we read "wet," on the other "dry." On a dry day the instrument is set and when the rain is in the air the humidity of the atmosphere has the effect of twisting the tinfoil and turning the squares of paper so that they read "wet."

HOW HIGH IS THE AEROPLANE?

NOW that aeroplane flights are becoming common in all parts of the country, the question—"How high is it," is asked on almost every occasion.

Of course the barograph is the most accurate instrument for measuring the height of flying machines, but so long as the machine can be distinctly seen a person upon the ground can, at the time



WIDOW'S BOMB-PROOF SHELTER.
The bomb-proof shelter provided by the British War Office for Mrs. Endacott, a Dartmoor widow, to protect her while artillery practice is in progress.

the birdman passes over him, make a fairly accurate measurement of his height with the simple instrument here described.

Take a common yard stick, such as is given away at many stores, and make a slide of sheet tin to fit over it as is shown in the illustration. The slide should fit snugly enough so that it will remain in any position in which it is set until a reading of the scale can be made.

The slide is made by cutting out a slot at the center of a strip of tin in such a way as to form two points which when bent at a right angle with the strip will be just one inch apart. The pattern in the upper left-hand corner of the illustration shows the way the tin strip should be cut to form these points. This operation is best performed with a chisel cutting upon the dotted lines and bending upward upon the solid lines.

After forming the points accurately, bend the strip around the yard stick in the form shown in the lower right-hand corner of the sketch and fit it over the stick so that the figures upon the scale can be read through the slot in the center.

THE SUFFRAGETTE'S STATUE OF VICTORY.
This heroic copper statue representing Victory is placed at the front of the headquarters of the Political Equality Association, of which Mrs. O. H. P. Belmont is president, in New York

HOW HIGH IS THE AEROPLANE?

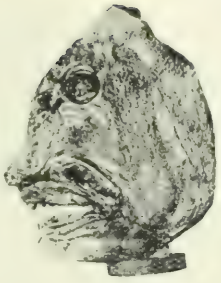
To ascertain the height of an aeroplane, its length must be known. Lying upon your back upon the ground place the end of the stick to your eye and set the slide so that the aeroplane can be just sighted lengthwise between the two points. Supposing the slide to stand at 14, multiply the length of the machine by 14 and the product will be the height in feet.

For the standard Wright machine, allow 40 feet; for the baby Wright machine, allow 20 feet; for the Curtiss machine, allow 30 feet, and for the majority of monoplanes, 30 feet. Thus suppose the standard Wright machine is flying above you: if, after sighting, the slide stands at 15, multiply 40 by 15 and the product 600 will be the height in feet at which the aeroplane is flying. This system was first used by the Wright Brothers at their testing grounds near Dayton, Ohio.

The device is one that will give considerable amusement and instruction to both old and young.

THE OLD MAN OF THE SEA

PROBABLY one of the most curious of all the marine creatures that have been brought to light in recent times is the fish head here shown possessing a startling human-like appearance. The old man of the sea—as the fish has been dubbed—was picked up in the waters around Cape Town, Africa. The realistic photographs shown were made in Africa. The head was not manipulated in any way. The ragged outline at the back of the head shows where it was severed from the body. The outlines on the lower part of the face are natural and are the outlines of the maxillary and other bones of the jaws. The nose has shrunk somewhat in drying. In life, the resemblance to the human face was even more striking. The conical front teeth are shown. The lateral teeth are very strong and molar like, evidently for the purpose of crushing shells and, like the famous king of the cannibal islands, "he has two rows in the lower jaw." Photographs of the head have been sent to a number of well-known authorities on ichthyology in Europe and Africa for the identification of this very remarkable species.



STRANGE FISH HEAD.

THE "OLD MAN OF THE SEA." HE BEARS A GROTESQUE RESEMBLANCE TO A HUMAN BEING.

PRAYING MACHINE.

Used by Tibetans, every twirl revolves the cylinder containing the sacred words of their universal prayer addressed to Buddha.

A RIGOROUS TEST OF A MOTORCYCLE'S STRENGTH.

A new designer did this to prove to the manufacturer his change in material for the fork was O. K.

TWO FEET IN THE AIR.

ALIGHTING TEN FEET FROM THE OBSTRUCTION, A FOUR BY FOUR INCH TIMBER.

OFF TO SUNDAY SERVICES IN TOWN—THE REASON FOR MANY ABANDONED CHURCHES IN THE COUNTRY.

AUTOMOBILE VERSUS COUNTRY CHURCH

By

F. G. MOORHEAD

FOR every four automobiles bought by Missouri farmers a country church in Missouri is abandoned. And the automobiles are held directly responsible by President H. J. Waters of the Kansas State Agricultural College. The ratio in the neighboring States is also high—one abandoned church to every five motor cars owned by farmers in Illinois, one to seven in Kansas and one to ten in Iowa. With an average ratio of one abandoned church to every six automobiles owned by farmers in the grain belt as a whole, the motor car is being held accountable for the passing of the country church and of the old style circuit rider.

Within the last few years one thousand seven hundred country churches have been abandoned in Illinois. In an equal length of time the doors of a thousand other churches, once regularly open on Sunday, have been closed for good in each of the neighboring States—Iowa, Missouri and Kansas. Many of these churches were dependent, for their sermons, upon circuit riders and preachers from nearby towns, and, for their financial support, upon the missionary societies of various large cities. Today, with a widespread prosperity among the farm-

ers of the grain belt, which has never been equaled, less is being spent for religious worship in the country and more for luxuries—notable in the list being the automobile, the motorcycle and the talking machine—than ever before. In a typical rural community of 370 families it was found that the average among them owned property worth $14,000, while the average family spent on itself $771 a year; on schools, $13.72; on roads, $6.00; on churches, $3.18. This community is in a rural section of a state in which more than ten thousand farmers own and operate automobiles.

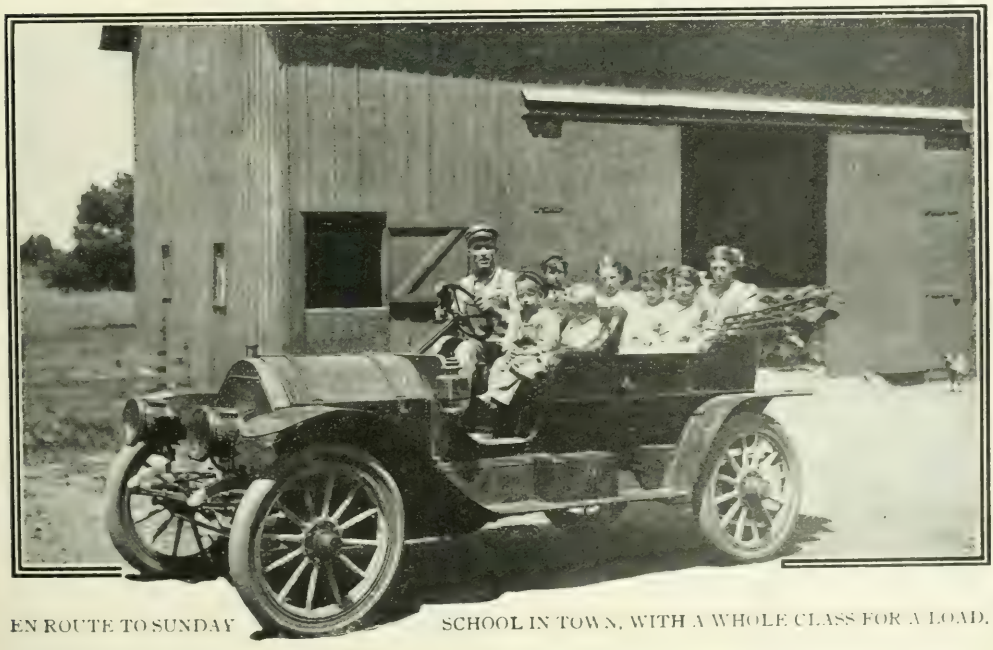
Here are President Waters' own words on the subject, uttered after long and careful investigation:

"The advent of the motor car, the building of better roads, the general prosperity of the farmer and the attendant luxuries of a nice team of trotters and a carriage to take the place of the old lumber wagon or of the spring wagon as the family carry-all, and the improvement in education, in ideals and desires are the elements that have brought about this change and are causing the abandonment of thousands of country churches."

But far from believing that the automobile is to be charged with a decay in religious fervor in the country, as well as with the abandonment of the country churches, President Waters maintains that the motor car should be commended, not condemned, for the turn things are taking. Here is the way he reasons:

"Formerly it was a hard job to get to church. Riding in an ordinary farm wagon, or even in a spring wagon is not particularly comfortable and if the farmer and his family are jerked along over rutty, rough roads by a team of old plow horses they are not calculated to be in an exceptionally enjoyable frame of mind during the church service and the lessons might all be jolted out of them going home. But there are some seven thousand or more Kansas farmers that own motor cars and there are thousands of miles of good dirt roads in the state and there are hundreds of good teams and good carriages. The farmers are now a reading and studying class, thanks to the rural route and the introduction of the daily and weekly newspapers and the magazines. It is no trick at all for the farmer to get up on a Sunday morning and after doing his chores, hitch up a team of roadsters to a nice carriage and drive seven or ten miles to the city for church service. With motor cars fifteen or twenty miles is not bad.

"Then the farmers' children have been



EN ROUTE TO SUNDAY SCHOOL IN TOWN, WITH A WHOLE CLASS FOR A LOAD.

SUNDAY MORNING FINDS THE FARMERS IN THE BARNYARD TALKING AUTOS INSTEAD OF GOING TO CHURCH.

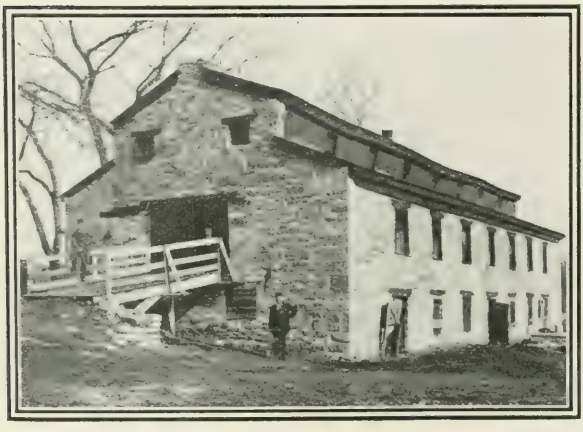
going to the county seat high schools or town high schools. They have made friends with many boys and girls and they like to go to church in the city and meet their friends.

"Then there is the church service itself. 'Music hath charms to soothe the savage breast' applies to the churches. A pipe organ or an orchestra beats a squeaky reed organ in every way and the singing of a trained choir with good accompaniment accomplishes wonders in the mind of the average person. Good music is as important as, and often more effective than the sermon."

Ex-Governor Hoch of Kansas goes even further than President Waters and argues that while the country churches are being abandoned by the thousand, largely as a result of automobiles and better roads, the amusement spirit, fostered by the automobile and the talking machine, is making its way into the country churches that are left and saving them from future abandonment.

"The country church should be open all week long," urges Governor Hoch, "and should be equipped as a club. It ought to have a library and a reading room and a room for games and social affairs. There is no harm in pool or billiards and many churches now have pool and billiard tables and bowling alleys, where young and old may enjoy themselves together. As a result, many who came to play remain to pray, and so the churches are being revitalized and saved from abandonment."

Both President Waters and Governor Hoch are authorities on the subject and have plenty of specific instances to point to in their own state. One of the oldest church buildings in Kansas, erected about forty years ago, and at one time the largest church edifice in the state, is now used as a barn, the congregation having utterly vanished.



ONCE THE LARGEST CHURCH IN KANSAS, NOW USED AS A BARN.

PERFECT FITTING SHOE FOR THE ARMY

By

FRANK M. BAUSKETT

FOUR years ago a board of army officers was appointed to devise a perfect fitting shoe for the soldiers of the United States Army. After long and painstaking experiments the board has completed its work and recommended to the War Department the adoption of a new kind of footwear, and one that has after rigid tests proved worthy of the years of endeavor spent in perfecting it.

Under the old regulations shoes of two patterns were ordered, one a straight and the other a slightly curved last, neither of which, however, gave satisfaction, and for years the percentage of imperfect feet in the army has been appalling. On long marches men have been forced to drop out on account of blisters, bruises and other shoe troubles. The new shoe has a log, flat heel, a broad rounded toe and a quarter of an inch more curve or swing than the old style, the straight last having been abandoned altogether.

The investigations carried on by the board have been of the most complete character. X-ray photographs have resulted in some very interesting information as to the effect on the feet of standing in certain positions, and marching both in light and in heavy equipment. The heaviest tests were made with the soldier in his full uniform and carrying the maximum amount of equipment—forty pounds. In the course of these investigations the tendency of the foot to spread as the weight is thrown on it, has been carefully studied, and the X-ray has shown the position taken by the various bones of the feet as affected by the changing position and weight. Photographs showing some remarkable experiments have been taken of feet in the old style shoe with forty pounds of pressure on the soldier's back, and of the same feet in the new shoes. Invariably in the old shoe some of the toes were shoved completely out of their proper position, but in the new shoe each toe has plenty of room, thus making marching with full equipment as easy as is possible.

The board during its labors examined thousands of soldiers' feet under varying conditions, carefully taking note and making report on each foot where trouble was caused by a shoe. These feet were also measured and photographed in every conceivable position, ranging from the most complete repose to the severest possible strain under the conditions of service.

In the final tests held at Fort Leavenworth the new shoe proved beyond doubt the success of the board's work. A march of nine days, covering 118 miles, was

THE NEW SCIENTIFICALLY PATTERNED SHOES ADOPTED FOR USE IN THE ARMY.

Toes Cramped in Old-style Shoes.
Shows what even a medium-pointed shoe does to the foot.

Comfortable Position of Foot in New Army Shoe with Forty Pounds Pressure on Wearer's Shoulders.

made by 375 men. Part wore the old style shoe and the others the new shoe. The latter finished the tramp easily, while a great percentage of those equipped with the old style footwear were forced to quit on account of shoe trouble.

The method now adopted by the army for "breaking in" new shoes results in a perfect fit, which reduces foot trouble to a minimum. Civilians might profit by the method provided the shoes are through and through real leather. After the shoes are fitted to the soldiers' feet the men are made to stand in water, ankle deep, until the leather is thoroughly wet, then they are marched around until the shoes have dried. In this way the footwear is made to yield to the characteristics of any individual foot and forever after is as comfortable as the proverbial "old shoe."

The new shoes will be made both in black and tan, the latter being worn for garrison and marching purposes, while the black will be used with the blue uniform and with full dress.

TO MAKE THE SUBMARINE SAFER

By

ROBERT G. SKERRETT

SOME months ago one of our submarine boats, while undergoing a deep-water test, gave her crew an hour and a half of hair-raising anxiety. The *Carp* had been submerged to a depth of two hundred feet in San Francisco Bay in order to prove that her hull was structurally up to contract requirements. Ordinarily, it is the custom, in making this initial test, to seal the boat watertight, without anyone inside of her, and then to sink her two hundred feet below the surface, the little vessel being secured to steel cables and these, in turn, controlled from a floating wrecking derrick.

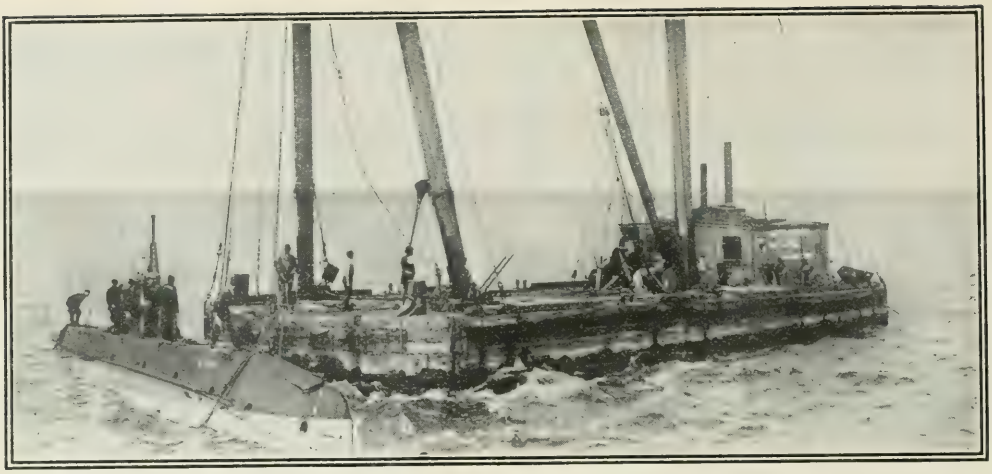
In the case of the *Carp*, however, the officer in charge and his crew believed the craft sound, and in a spirit of venture decided to go down in her. Apparently the *Carp* was anchored, and as she sank, the steel anchor cable was hauled inboard until she settled at the bottom right over the anchor. In some manner, the cable became jammed and would not feed out when it was time for the *Carp* to rise. All efforts to release her were unsuccessful for more than an hour. Finally, after about ninety minutes of suspense, the *Carp* rose to the surface suddenly at high speed, and her momentum was such that her bow broke clear of the water for nearly fifty feet like the "broaching" of a big whale. The incident had all of the thrills of a narrow escape from death.

MAJOR CESARE LAURENTI, INVENTOR OF NEW APPARATUS FOR TESTING SUBMARINES.

The testing and salvage dock designed by Major Cesare Laurenti, late of the Italian navy, is intended to avoid just such hazards and to make it possible to subject a submarine to all of the physical stresses of deep submergence without resorting to that rather clumsy way of proving the hull strength of an underwater boat.

Even though the submarine be lowered two hundred feet below the surface and instruments be placed inside of her which will record how the pressure of the external water squeezes the hull temporarily more or less out of shape, still these recording apparatus do not tell where a leak has occurred. As there are no people inside to watch for the places where water may force its way in, the inspectors are left to guess, later when they enter the vessel, where these weaknesses or crevices are. The leaks probably occur only when the submarine is deeply submerged. Now Major Laurenti provides a dock which makes it possible to remove all of these doubts and to test the submarine at the surface and at the wharf of the shipbuilding yard.

The dock Laurenti recently launched at Spezia, Italy, consists principally of a very strong steel tube which is closed at one end and has a removable caisson or stopper at the other. This long cylinder is partly encompassed by an outer structure composed of a number of tanks, which can be filled so as to cause the

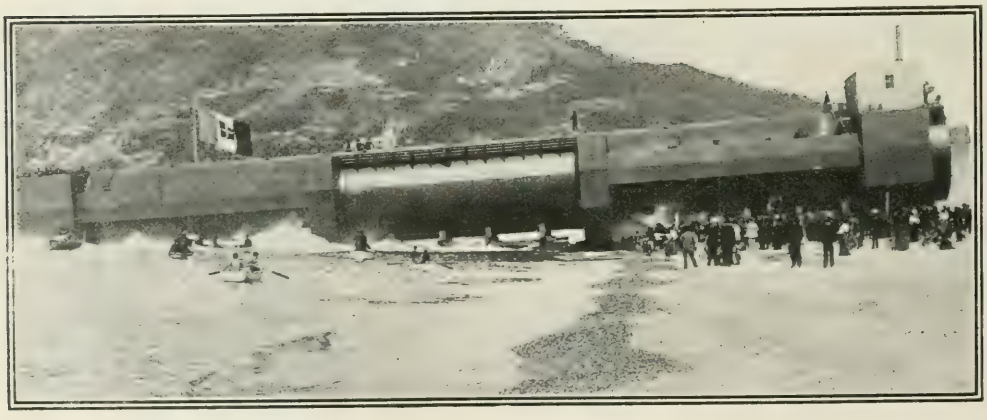


THE CRUDE TYPE OF APPARATUS USED IN THE U. S. NAVY FOR TESTING SUBMARINES.

dock to settle deep enough in the water, to permit a submarine to be floated into the steel cylinder when the stopper is removed for that purpose. Again, when it is desired to lighten the dock, all of the water ballast in these tanks as well as that in the enveloping tube is expelled by means of pumps.

With the caisson released and swung to one side, the submarine is floated into the tube and properly secured so that she will remain in a fixed position. The stopper is then adjusted and the tube sealed. With this done, the inside of the dock is completely flooded so that the submarine is entirely surrounded by water just as she would be if submerged below the surface of the sea.

Of course, this produces but a very slight pressure upon the under-water boat. However, Major Laurenti provides a way to obtain the desired effect. A steam pump of sufficient power is connected with the inside of the big pressure tube, and this pump tries to force more water into the cylinder which is already filled. This effort gradually raises the pressure of the confined water which can not burst outward because of the strength of the enveloping cylinder of steel. The submarine is sealed, that is, she is air-tight and water-tight with observers inside of her, and the encompassing water, therefore, reacts upon her in its effort to escape the thrust of the steam pressure pump. Step by step this pressure, trying to crush her inward, rises until it is a duplicate of that to which the submarine

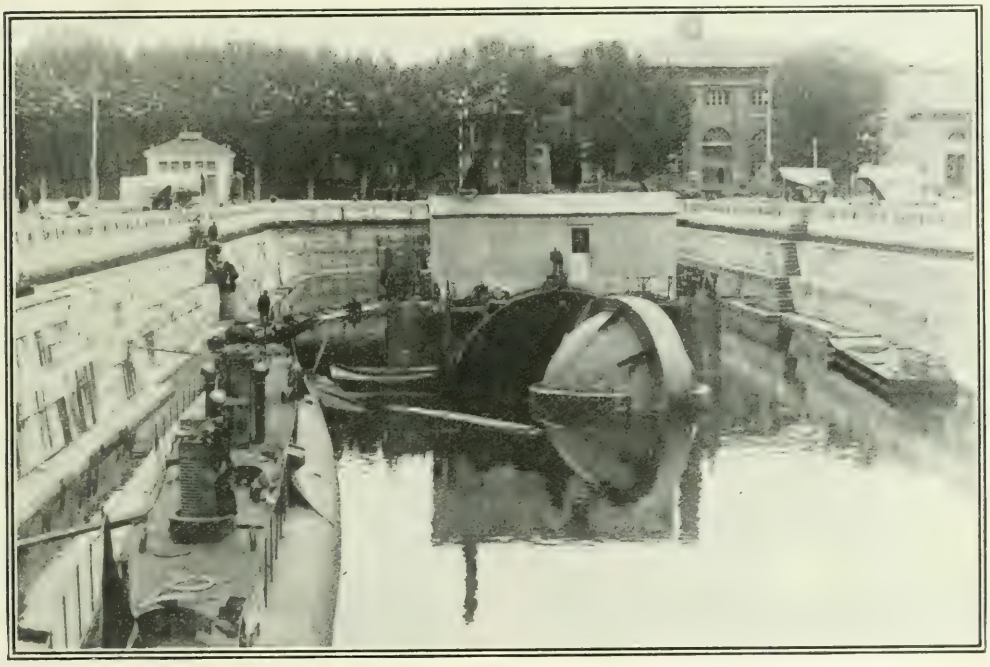


NEW TESTING DOCK BUILT FOR THE ITALIAN NAVY, FOR SUBMARINES.

would be exposed at a depth of two hundred feet as government tests stipulate.

The observers inside of the submarine are in telephonic communication with the personnel managing the dock and controlling the pressure pump, and there is not the slightest danger because the pump can be stopped instantly and the water pressure can be relieved in a few seconds. The people within the craft can also watch closely all parts of the hull of the boat and likewise examine leisurely every valve which controls a connection with the outside water. They can note, too, just when and at what pressure leaks, if any, develop. Even the layman can see how much better this system is than the one which exposes a testing crew to risks like those that the *Carp* ran.

To remove the submarine from her dock, the pressure is released, the sealing caisson is floated out of the way, and the vessel is cast free and withdrawn. If it were desired to use this dock as an ordinary floating dock for submarines, the enveloping tube could be drained dry after the submarine had entered, the hatches on top could be opened to let in the sunlight and the air, and the little vessel would be as accessible for painting or repairing as in an ordinary dry dock. As Laurenti's device is a floating structure, it can be towed to any point for the purpose of salving a sunken submarine. In this work, it would operate like a single big wrecking pontoon, and, having a lifting capacity of several hundred tons, it could raise a large under-water boat—being first partly submerged by having its tanks and steel tube flooded and then drained, to give it added lifting power after chains had been secured to the foundered vessel. In this way a submarine could be raised from the bottom and progressively carried into shallow water and then made temporarily watertight so that she could be floated either into this salvage dock or into any other available dry dock.



THE CAISSON RELEASED AND BEING FLOATED TO ONE SIDE PREPARATORY TO PUTTING THE SUBMARINE—AT THE LEFT—INTO THE DOCK.

NOT COMING DOWN, BUT GOING UP—BLANKET-TOSSING IN THE ARMY.

BLANKET-TOSSING IN THE ARMY

NOW don't deceive yourself when looking at the accompanying photo into the belief that the man in the air is making a hurried escape from the sixth story of a burning building. Fact is, he was not coming down when photographed, but, on the contrary, was still aviating heavenward when the cameraman snapped the button. And it isn't a springy fireman's net he expects to light in, but an army blanket, drawn taut in the hands of a score or more of his comrades. Blanket-tossing is the recruit's first introduction to his bed when he joins the army, and, remarkable to relate, out of the thousands that have been so tossed skyward, but a very low percentage have been seriously hurt. As the practice is brimful of fun for the tossers it is looked upon as legitimate by army commanders. Blanket-tossing is a fine testimonial to the strength of army blankets, for a piece of cloth so well woven that it will not tear under such strains certainly has quality. In the long run the recruit may be all the better for his "pains."

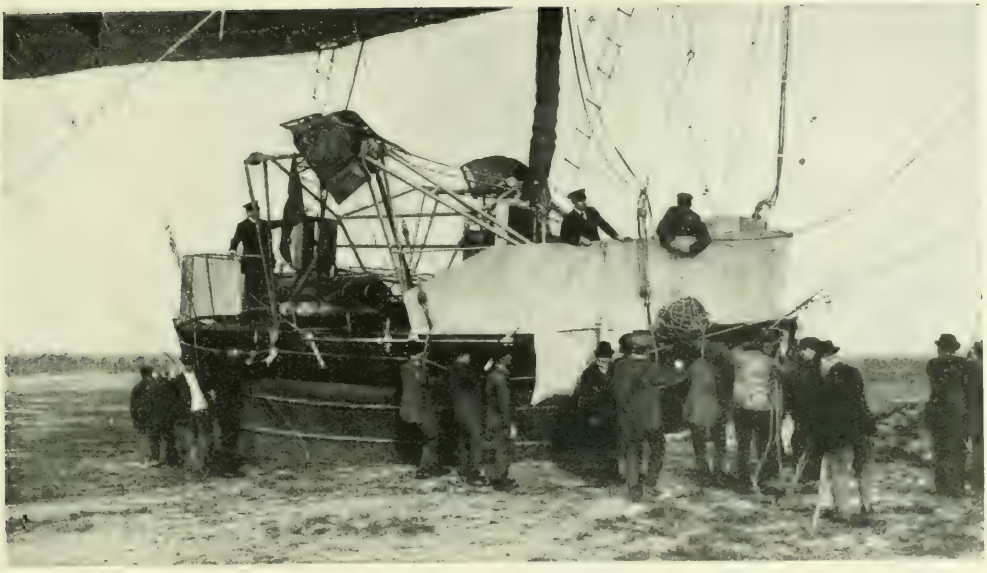
TO PEEP INTO MERMAID GARDENS

A BOAT based on an ingenious idea, was recently launched at Camden, N. J. Scientists believe this craft will result in marvelous discoveries of the mysteries of the deep seas. It was constructed especially for investigation of the ocean beds, for locating wrecked ships, for the study of aquatic and animal life beneath the waters. It can also, of course, be used as a pleasure craft.

From stem to stern, the bottom of the novel vessel is laid with plate glass more than an inch thick and divided by steel frames into sections securely sealed to make it absolutely watertight. A specially constructed submarine radio-light has been devised for illuminating the sea and bringing objects resting upon the bottom or floating at great depths into clear view. Provisions have also been made for the sinking of incandescent lamps, to be dropped from the bottom of the boat into the vicinity of wrecks or other objects to be inspected.

The vessel is sixty feet in length, is driven by a twenty-five horsepower gasoline engine, and can make a speed of ten knots per hour. There will be plenty of room aboard for the accommodation of fifty passengers besides the crew. During the coming winter it is planned to use the craft for scientific investigation in the Gulf of Mexico and around the Bahama Islands.

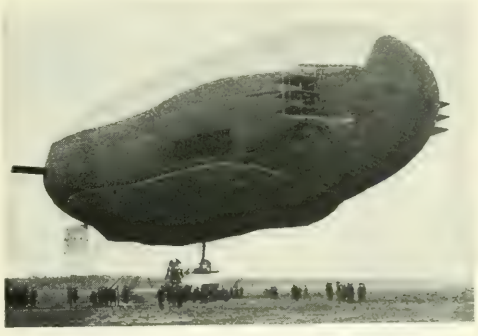
BOAT TO BE USED IN SEARCHING OUT OCEAN'S SECRETS.



THE NEW GERMAN AIRSHIP *SUCHARD*.
It is proposed to sail to America in this craft. The cabin has the form of a motor boat for this trans-atlantic flight.

NEW AUTOMATIC RAPID FIRER

THE various armies of Europe have for several years employed automatic rapid-fire gatling-guns intended to accompany both infantry and cavalry in the field. A new English gun that has done good service is herewith shown. It has been desired to lessen the weight and also to increase the number of shots which can be fired in succession without overheating the gun. All rapid-fire guns have a tendency to become overheated. This increases the diameter of the bore and results in the ball, which is no longer guided in the groove, shooting at random. The heating of the metal is retarded by surrounding the barrel with an envelope containing cold water. But even then as the water itself soon reaches the boiling point the heating is merely delayed.



THE FIRST ASCENT OF THE *Suchard*.

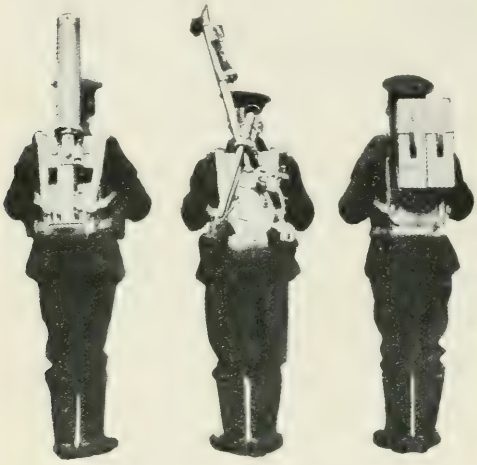
READY TO FIRE THE NEW AUTOMATIC RAPID-FIRER.

The new machine weighs but half that of the ordinary gatling-gun. It is mounted on a tripod. Three men are able to carry the entire outfit including ammunition.

The cooling apparatus consists of a metallic reservoir provided with a force-pump and filled with water. This reservoir can be connected by two flexible tubes to the refrigerating envelopes which surround the gun, so that by means

of the pump the warm water can be replaced with cold.

The use of the reservoir is optional and may be reserved for exceptional circumstances. By means of this arrangement the gatling-gun has been able to fire



THREE MEN ARE ABLE TO CARRY THE VARIOUS PARTS OF THE NEW MACHINE GUN.

thirty thousand shots in succession without impairment to its accuracy by overheating.

JAP BOY SCOUTS

THE boy scout movement bids fair to reach from "Greenland's icy mountains to India's coral strand," and indeed to girdle the globe, if reports from distant lands are any index of the popularity of the idea. The accompanying illustration shows what is being done in the city of Tokio, Japan, in this respect. The little company thus shown so proudly parading is a band of musicians who are playing upon some sort of reed instruments. The national flags, with another—that at the head—showing in bold characters what the little troupe stands for, may be seen quite conspicuously displayed.

JAP BOY SCOUTS ON THE MARCH.

RIVAL OF THE ARMY MULE

IN the carabac, or "water buffalo," of the Philippine Islands, a successful rival has been found for the army mule. Indeed, this is the only successful rival yet

COLORED TROOPS IN THE PHILIPPINES USING "WATER BUFFALO" FOR TRANSPORT.

to manifest itself. In the trials and tests made during the past few years between the mule and the motor truck, the first honors all went to the mule in the work of transporting army equipment. But in the Philippine Islands both the mule and the motor car must give way to something far more primitive, though more adaptable to the wretched paths of the island interior. In the immediate vicinity of Manila the roads are nearly all macadamized, and are in excellent condition; but farther out they are nothing better than narrow paths in soft, black soil, which becomes very slimy and very muddy during the wet season. And the Philippine "wet season," be it known, beats any part of America for genuine "wetness." This rainy season lasts from June until October, and a rainfall of over one hundred inches for a single season is not an uncommon thing—in truth, is more the rule than the exception. Thus the "water buffalo," which is a sort of cousin to the patient ox, proves himself to be a very serviceable animal.

AN OCEAN RAILWAY AT LANGWOOD, ON ENGLAND'S EAST COAST.
Visitors, arriving by ship, must land in this way. The tides rush violently over a shallow bottom, making it impossible to use small boats for the purpose.

POWER BOAT WITH WINGS

THE hydro-aeroplane, the latest development of Glenn Curtiss, was built primarily for the United States Navy, but will no doubt be later included in the equipment of the Army, also.

The new invention is called an aeroboat because it is really a power boat with wings, designed to run both on the water and in the air. The body is very light and constructed along the lines of a speed power boat. The machine carries two persons comfortably seated side by side and they are protected by a spray hood in front. The boat is attached immediately under the lower plane. The craft is very speedy and is said to be capable in almost any sort of water; but it cannot be kept in the water at too high a rate of speed because at about forty miles an hour it will rise into the air. Its speed in the air is about sixty miles an hour. It can be started on the water and will rise and soar away within two hundred feet. It has the advantages of the motor boat and flying machine combined and, compared with the aeroplane, makes flying over water very safe. The aeroboat is a distinct advance in air-and-water craft.

A Boat That Flies.

NEW TYPE WATER-SKATE

ATTEMPTS have long been made to design some outfit for walking on the surface of water; however, the water skates designed to this effect all proved impracticable on account of their excessive weight and dimensions.

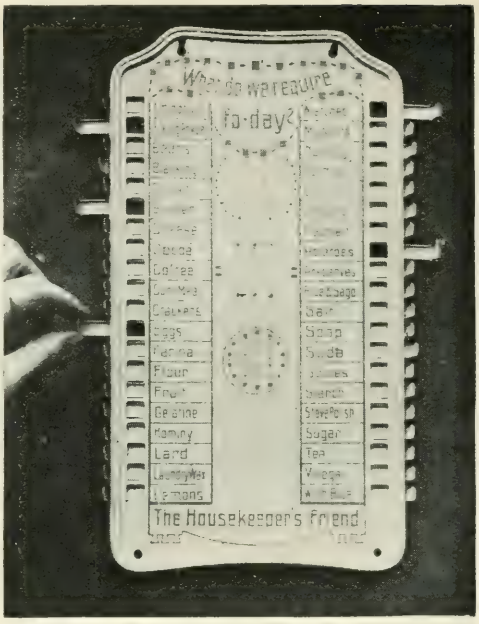
However, there have recently been made on the Lake Grosswusterwitz, Germany, some most successful trials with water-skates in an improved form. The new skates are filled with compressed air and outwardly resemble skis; on account of their low weight and small dimensions they enable skaters to glide most easily over the water. Another advantage of these skates which are easily transportable, is the possibility of folding them up into a handy little package, after expelling the compressed air from the caoutchouc cylinders surrounded by sail-cloth covers. After being

emptied the water skates are of course quite as quickly put into working order again, and hence give very little trouble to the users of them.

Below the skates are fixed some fin-like flaps which by opening at each motion allow the skater to advance with remarkable ease. Another feature which increases the variety of this new sport is the possibility of using alternately or simultaneously a light oar. Thus equipped, skaters find their way with the utmost ease even in the midst of all kinds of boats.

This new sport is not only pleasurable, but is by no means dangerous. The rod fixed below the skate in fact ensures a sufficient stability to eliminate any risk of capsizing. In case, however, the skater should still fall into the water, he would only have to disentangle his feet by a swift motion in order to swim to the shore while using the skates as salvage buoys.

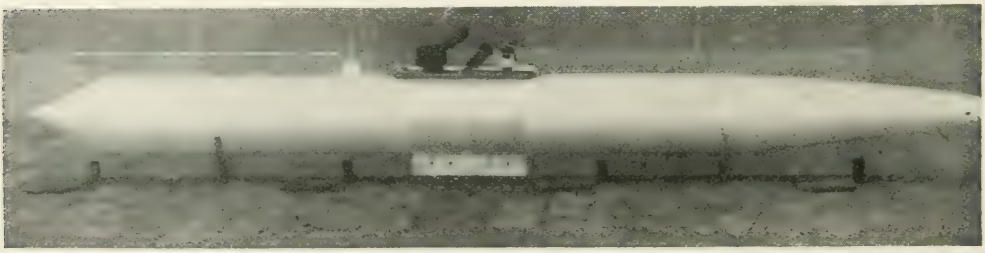
WATER-SKATING ON THE LAKE GROSSWUSTERWITZ.



THE HOUSEWIFE'S FRIEND.

THE HOUSEWIFE'S FRIEND

THE photo shows a little novelty that ought to find a place in the kitchen of every careful and methodical housewife. As will be seen, it consists of an enameled iron placque on which is printed a list of practically all the kitchen requisites. Beside each article is a small section made to slide backward and forward. When these little slides are out they show red, thus denoting quite plainly the articles which one is in need of. When the stock has been replenished the slide is pushed home again and is then ready to show its usefulness at any future time. This little article is tastefully got up in blue and white enamel and is as ornamental as it is useful.



NEW TYPE OF WATER-SKATE THAT HAS PROVED SUCCESSFUL.

DRIVING TIES DOWN THE RIO DEL SANTA BARBARA IN MAY.
Note the heavy snows on the mountains.

LOG DRIVING IN THE DESERT

By

NELSON L. LE GRAND

THIS is a story of the desert, the mountains, and a man.

It is a story of droughts and cloudbursts, of great canyons cut deep into the cliffs, and half-filled with boulders as big as a house, and of a man who had vision and courage to conquer all the difficulties put in his way, to clear a path two hundred miles long through the wilderness, that the forces of civilization might be served.

The digging of the Panama Canal is the greatest engineering feat of the century. This is the story of a lesser accomplishment — necessitated by the building of the Canal—but which required the same qualities which have made the big ditch a reality.

The Canal means cheap freight rates from coast to coast and keener competition than the trans-continental railroads have ever had to face. To meet it the Santa Fe, which had more than a thousand miles of single track railroad in Arizona and New Mexico, decided that it must double-track its line through to the Pacific. One of the first necessities for railroad building is wooden cross ties—120,000 lineal feet being required for every mile of rails. Where was all this timber to come from?

The continental traveler going west over the Santa Fe sees chiefly the desolate and yellow desert country which stretches all about, and concludes—as did the early geographers—that this is indeed the great American desert. Even when the train climbs up a mile and a half into the sky, as it does at Glorieta, New Mexico, there is little to tell that,

Logs in the Yard Ready to Be Hauled to the Saw Mills.

Pueblo Indians Employed by the Tie Company.

high up, on the slopes of the grim mountains, grow enormous forests of hard wood.

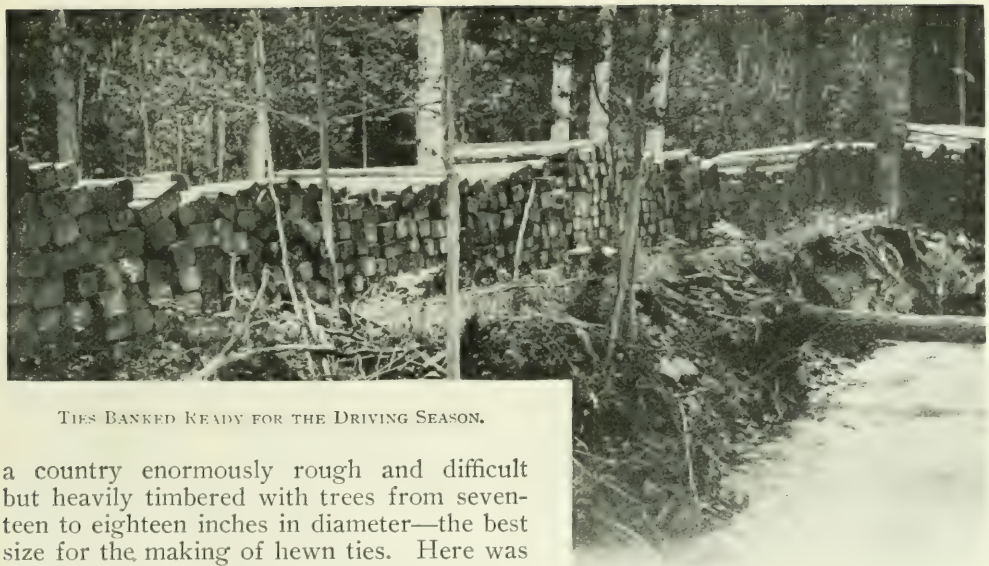
It is the lack of rainfall on the lower levels which prevents the growth of vegetation, and it is the deep snowfalls of winter and the sudden floods and rains of spring which are responsible for the heavy growth of forest trees on the sides of the mountains, from seven to nine thousand feet up.

Most of the forests within easy reach of the railroad had been exhausted in furnishing ties for the first through line of the Santa Fe, and for supplying the constant yearly demand for tie replacement. For a new line many millions of ties would be needed. The problem was where to get them without paying great sums for their transportation from a long distance.

Some years before A. B. McGaffey, a Vermont Yankee, had gone down into the mountains of New Mexico and secured the right to establish commissary stores in the camps operated by certain lumber companies. In his boyhood he had seen lumbermen at work in the Green Mountains, and he personally became interested in buying up small trees left by the lumber companies and hewing from them cross ties for the lumber company.

When word came that the Santa Fe was to be double-tracked and that there was a market for millions of ties, McGaffey bestirred himself.

On horseback, with a companion or two, he rode for weeks through the Sangre de Christo Mountains looking for a land grant on which grew forests of sufficient size to furnish the enormous number of cross ties necessary. Away up in the northern part of New Mexico he finally found a tract of 125,000 acres,



Ties Banked Ready for the Driving Season.

a country enormously rough and difficult but heavily timbered with trees from seventeen to eighteen inches in diameter—the best size for the making of hewn ties. Here was timber sufficient for the manufacture of 16,000,000 ties.

But the source of supply being found, the great problem still remained to be solved. More than one hundred and forty miles away, at Albuquerque, was located the great "pickling" plant to which every tie must be transported for treatment before it was put into place. The country between McGaffey's land grant and Albuquerque is one of the most difficult in the world. Through the center of the grant itself run the Sangre de Christo Mountains, towering up more than two miles, and immediately to the south the jagged masses of Pecos Baldy and Jicarilla project to a height of 13,000 feet. Beyond the mountains and separating them from Albuquerque lie a succession of deep river canyons, high peaks, the sides of which are strewn with boulders, and a tangle of rough and broken country over which the construction of any road is a practical impossibility. How, then, should McGaffey get his ties down to Albuquerque? That seemed an unanswerable question.

In the old days in Vermont he remembered the picture of the river drivers sending their great rafts of logs down the swollen streams in the spring of the year. Perhaps it would be possible for him to utilize the shallow mountain streams and drive down his ties to the broader waters of the Rio Grande, on which Albuquerque is located, more than two hundred miles away as the waters flow.

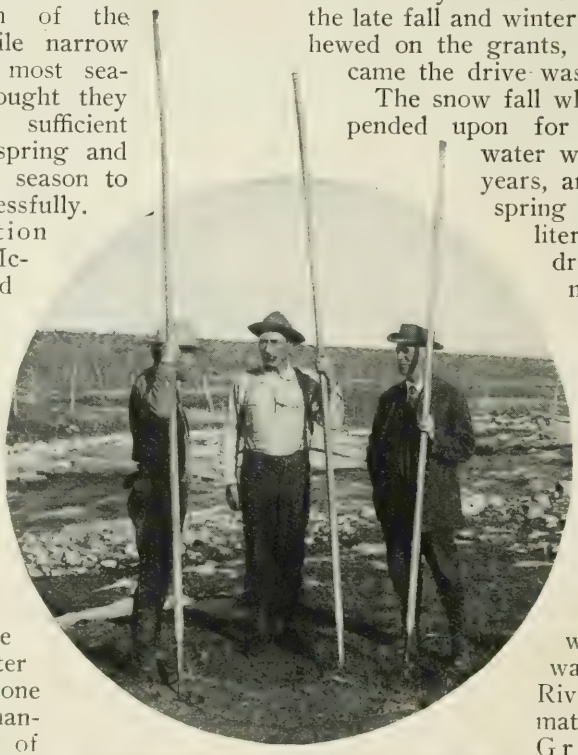
Again McGaffey and his chief engineer "Ted" Drake started out on their bronchos. Down over the steep shoulders of the land grant ran two creeks, the Rio del Pueblo and the Rio del Santa Barbara. Near the foot of the grant they unite and form the Embudo River, which empties into the Rio Grande, some miles beyond the limit of the land grant.

About eight miles from the Rio Grande the explorers entered the deep, narrow Embudo Canyon, whose walls rose sheer for seven hundred feet. The stream bed was narrow and choked with thousands of boulders, some as large as small houses and weighing hundreds of tons. So thick were these boulders in places that the stream disappeared from sight under them. Here horses were abandoned and the little party proceeded on foot, working laboriously up stream. The canyon bottom was so narrow that for considerable distances there was no room for a trail, and the men had to wade up to their waists in the ice cold waters. In other places they were forced to climb over great boulders piled in the stream bed in chaotic masses, in imminent danger of broken limbs if a false step was made or an insecure hold obtained. For five weary miles they

struggled on in this manner, finally emerging at the upper end of the canyon, satisfied that if the latter could be negotiated, the most difficult of their troubles in driving the streams would be solved. The one good feature possessed by the canyon was the excellent banks which its walls offered for the stream.

From the upper end of the canyon to the confluence of the Rio del Pueblo and Rio Santa Barbara, which together formed the Embudo, the going was easy, through shallow canyons that offered no serious obstacles, and across open rolling valleys. These streams having their sources high up in the mountains, and fed by numerous springs, rivulets, and in spring by melting snows, were the principal channels of the drainage system of the grants, and while narrow and shallow at most seasons, it was thought they would contain sufficient water in early spring and during the rainy season to float ties successfully.

The exploration completed, Mr. McGaffey decided that it was feasible to drive ties by water all the way from the grants to the boom to be located at the lower end of White Rock Canyon on the Rio Grande, a distance of approximately one hundred miles, after some work was done to improve the channel and clear it of boulders, particularly in Embudo Canyon.



THE MEN WHO FOUND A WAY TO DRIVE LOGS THROUGH THE DESERT.

From left to right: "Ted" Drake, one of the superintendents; a river foreman; and A. B. McGaffey. The poles they hold are used in handling ties.

Accordingly, both grants were purchased, and a contract made to furnish the Santa Fe with a certain number of ties yearly for a period of five years. A stout boom eight hundred feet long was constructed of heavy logs, three deep, the whole strongly bound together with heavy chains, and swung across the stream. To add strength to the boom, numerous log crib-piers were built and sunk to the river's bottom on the lower side of the boom by filling with rock. In the fall of 1907, twelve thousand ties were purchased from small operators who delivered them on the banks of the Rio Grande near the town of Espanola above White Rock Canyon, and a test drive to the boom was made, demonstrating that no difficulty would be encountered in driving the main river.

It was now too late in the season to start to make improvements on the small streams, and it was decided to begin operations in the woods at once, trusting that the high water of the spring floods would carry the drive through. During the late fall and winter 100,000 ties were hewed on the grants, and when spring came the drive was launched.

The snow fall which had been depended upon for producing high water was the lightest in years, and there were no spring rains. Each tie literally had to be dragged "by the nose" over the rocks and shallow flats by a large force of men. Three weeks of most valuable time were consumed in this manner and by the time the ties were through Embudo Canyon there was hardly enough water in Embudo River to float a match, and the Rio Grande was still eight miles away.

At this critical stage the river foreman, an old Michigan "river dog," wired Mr. McGaffey, who had gone to Albuquerque on urgent business, that he had "hung up the drive,"—that all progress was stopped. Here, indeed, was a desperate situation, particularly so since it was the critical

A SECTION OF THE FLUME DOWN WHICH 125,000 TIES WERE SENT.

point in the great experiment of getting the ties to the Rio Grande upon which hinged the success or failure of the whole undertaking.

Mr. McGaffey immediately left for "the front," in no cheerful state of mind. When he arrived at the mouth of the Embudo in the bottom of the deep gorge of the Rio Grande, to use his own words he "was the bluest mortal on earth."

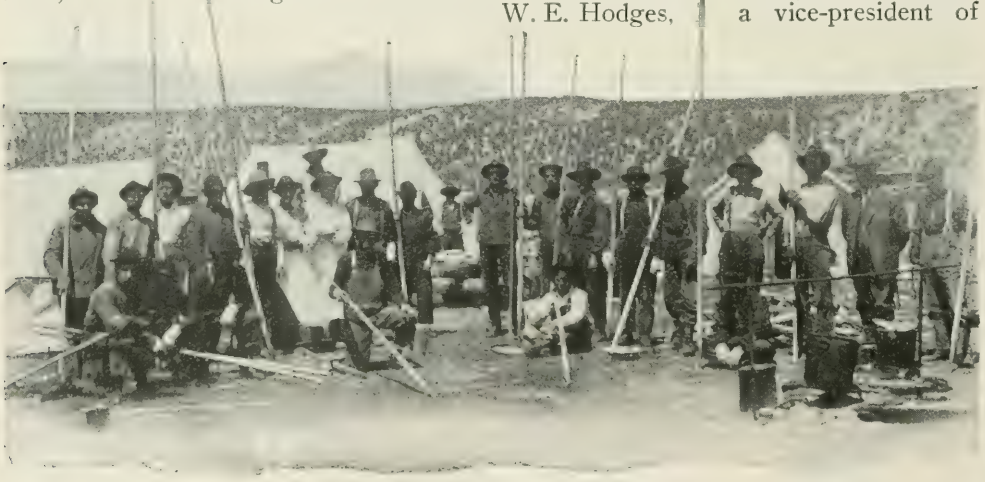
But here it seemed as if Divine Providence came to his assistance. The Rio Grande had just been forded, when attention was suddenly attracted by the roar of the Embudo River. He leaped from the buckboard and rushed to the river's edge. Looking upstream the sight that met his eyes was beyond description. A wall of ties, their white wet surfaces glistening brightly in the sun, was pouring from the mouth of the Embudo and rushing downstream. The sky overhead was clear, with no sign of rain. But about thirty miles upstream near Jicarilla Peak, an enormous cloudburst had occurred on the Rio del Santa Barbara, and a wall of water ten feet high swept downstream carrying the thousands of ties before it, putting them practically all into the main river, badly scattered, it is true, but all where they could be easily reached.

Said Mr. McGaffey in relating this experience: "I believe you were never about to be hanged when a messenger arrived with a reprieve just as the hangman was about to spring the trap. If not then you cannot appreciate my feelings."

After considerable work the ties were all delivered safely at the boom. While it was realized that a large element of "luck" had entered into the success of this initial attempt, as a result of it Mr. McGaffey felt confident that by making a channel through the Embudo Canyon and conducting other improvements, with average conditions of water, driving could be accomplished successfully as a regular thing.

Now that it was demonstrated that the undertaking was a success the railroad constructed a spur track twelve miles in length, connecting the boom-site with the main line near Domingo, over which to haul the ties as they were taken from the river. The main boom was further strengthened, and sheer booms swung into position along the stream where needed. More or less trouble had been caused by having the ties forced into the mouths of numerous Mexican and Indian irrigation ditches which were fed by the Rio Grande, bursting their banks, which had to be repaired. It was planned in future drives to protect the mouths of these ditches against destruction by placing ties across them to form a sort of sheer to ward off the main body of ties as they floated down. This plan put into effect worked satisfactorily. A large crew was set at work blasting a channel through the boulders in Embudo Canyon. Over forty tons of dynamite were used for this purpose in the distance of five miles, and this portion is the best piece of the river today.

A saw-mill with a daily capacity of one thousand ties was built on the Santa Barbara River for the purpose of sawing ties from those trees too large for economical hewing, of which there was a large number located on the lower portions of the grants, and about it a town sprang up as if by magic. This town was named Hodges, in honor of W. E. Hodges, a vice-president of



A CREW OF RIVER DRIVERS IN CAMP.

the Atchison, Topeka and Santa Fe, and the only man who had implicit faith from the start in Mr. McGaffey's undertaking.

Much of the timber to be cut in the saw-mills must be hauled several miles from the woods. For this purpose many tons of twenty-pound rails, sufficient to lay several miles of track, were hauled a distance of twenty-six miles on wagons over rough mountain roads, from the town of Embudo located on the narrow gauge line of the Denver and Rio Grande Railroad and a railroad having a 30-inch gauge was constructed. A twenty-four ton, rigid frame, geared mountain locomotive was hauled to Hodges, in sections on trucks, and assembled there. It is a novel experience to leave the Denver and Rio Grande, and after driving twenty-six miles into the heart of the mountains, to hear suddenly the shrill whistle of a locomotive, and to see it come busily chug-chugging to the mill with several cars of heavy logs in tow.

A considerable quantity of timber of fairly large size was discovered high up on a plateau. It was decided that the best method of working up most of this timber, was, because of its size, to saw, instead of to hew it into ties. For this purpose three small portable mills were hauled in and set up after much trouble and labor. In one instance to reach a suitable mill-set where water was available, four miles of road had to be constructed at great expense through the solid forest. When it was completed the boilers were loaded onto heavy trucks and dragged slowly and laboriously to an elevation of ten thousand feet by a team of twenty heavy horses. When this mill was first operated, considerable difficulty was encountered in keeping up steam owing to the rarity of the air at such a high altitude. However, after considerable experimenting in methods of firing, use of draughts, fuel, etc., this trouble was largely overcome.

One of the Odd Sort of Engines Used in Mountain Logging.

Log Bridge Across the Rio Grande Near Embudo.

Timber Is Plentiful Along the Rio Del Santa Barbara, and It Is Used as Material for Dams.

A total of over three hundred men are employed in the operation of the production. One-half of these are connected with the saw-mills, and work on the general logging operations; the remainder are Mexicans, engaged in hewing ties from the tree with the aid of broad axes, living in tents or brush shacks, doing their own cooking, all smoking the inevitable home-made cigarette. Many of these hewers are veterans of the recent rebellion which overthrew the Diaz regime. Sixty-five to seventy teams of horses are constantly engaged in skidding or hauling the ties.

The working season on the higher slopes and ridges is short, lasting from June to November first. During the balance of the year the upper regions are

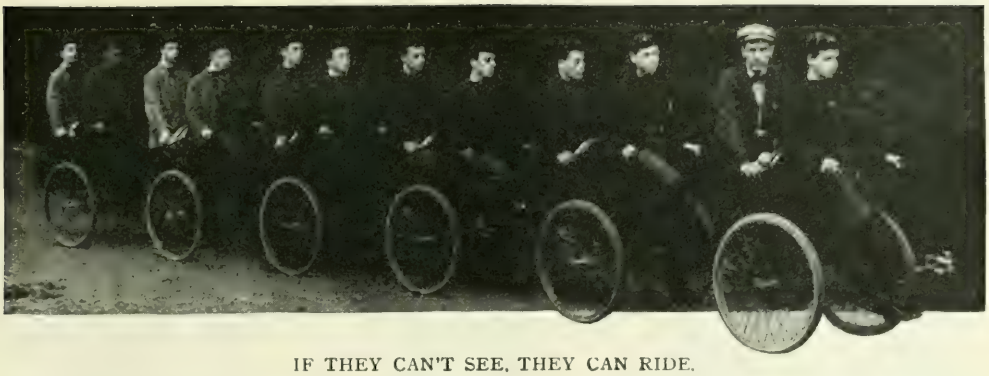
closed to men by many feet of snow. Work in the mill at Hodges and hewing in the lower regions, however, are continued the year round.

After the ties are hewed they are skidded or hauled to the streams and stacked for drying, remaining so until the driving season opens. Hundreds of thousands of ties, however, are made high up on the slopes and ridges where they cannot be reached by horses. To get these ties to the streams, several long pike-poles pull, push and otherwise help along those ties that run aground or on the rocks. The hardest work is encountered on the small streams. Progress is slow and as advantage must be taken of the high water, the large crew is kept busy. Once the ties reach the Rio Grande, however, fewer men are required and the force is largely reduced. The scene presents many of the aspects of a log-drive in the Northeastern States. Sleeping and cooking tents are used, the

UPPER ENTRANCE TO THE EMBUDO CANYON AS IT LOOKED AFTER THE CHANNEL WAS CLEARED.

miles of log chutes and V-shaped water flumes were built, down which the ties are shot. In one such flume about three miles long, 125,000 ties were sluiced during the past spring—a showing certainly not to be despised.

Perhaps the most interesting phase of the whole operation is the river-driving. When the waters reach a certain stage in the spring, some two hundred men are employed in "throwing in" or putting the ties into the streams. Others armed with camp or "wongan" moving down stream in boats in the wake of the men, frequently changing sites each day. The river men, clad in flannel shirts and heavy trousers rolled up or "stagged" half way to the knees, wearing heavy hob-nailed or "caulked" boots, and armed with long pike-poles are a husky lot with husky appetites, requiring no second call or urging when the cook shouts "Come an' get it, or I'll throw it out o' the window."



IF THEY CAN'T SEE, THEY CAN RIDE.
Multicycle designed to carry twelve passengers.

MULTICYCLE FOR THE BLIND

THE multicycle shown in the illustration was constructed to carry twelve cyclists, and is in use at the Royal Normal College and Academy of Music for the blind, situated at Upper Norwood, England.

This multicycle is made up of six two-wheeled cycles coupled together, each cycle holding two persons. Between each successive pair of wheels there is a connecting bar to form the complete train. The length of the machine is twenty-eight feet, and it carries its twelve passengers quite satisfactorily.

Each pair of wheels is a unit in itself, including differential gearing in the single axle, and seats for two riders, one being in front of the handle bars. The frame is of special design, the front seats being carried on vertical supports, as is also the handle-bar pillar connecting with the axle, while the rear seat is supported on the raised hump of the bar, uniting the successive pairs of wheels together, except in the case of the extreme rear rider, where the seat is also carried on a vertical pillar from the main framing of the machine.

Of course the machine has to be guided and controlled by a person with sight, who, in this instance, occupies the second seat, which gives command of the first pair of handle bars. The slightest deviation to either side of the front wheels is transmitted through the coupling bar to the second pair of wheels, the driver of which can act in concert, thereby conveying the same intimation to the third unit, and so on to the end of the machine.

VOLUNTEER WOMAN'S FIRE BRIGADE IN THE OLD CITY OF IDRIA, AUSTRIA.
This is but a detachment. In all sixty women put out fires as do their husbands, brothers and sweethearts.

"CITIZENS" OF THE GARDEN CITY OF THE INSANE CARRYING MILK FROM THE BARNS.

As first step towards abolishing the asylum system, Germany has built an institution on garden city lines at Bedburg, in Rhenish Prussia. Everyone enjoys complete freedom, and so pleasant and comfortable is the life that sane people pretend to be mentally deranged in order to obtain admission to this sylvan spot. The institution, which cost $2,500,000, provides accommodations for 2,200 patients, and has its own farms, bakeries, ice factory, waterworks, church and theatre.

A GAME AT CARDS IN THE GARDEN CITY.

It is quite easy to escape, but no one thinks of doing so.

LAST VOYAGE AS A SAILER

THE full rigged steel ship *Erksine M. Phelps,* holding more records for fast voyages than any other ship afloat, and distinguished for being the first vessel to be built in the United States of steel made in this country, is on her last voyage as a sailing vessel. She is now on her way around Cape Horn en route from Philadelphia to San Francisco, and on her arrival there, her owners will say goodbye to her as a sailing vessel and formally enter her in the steam class by having installed in her an auxiliary engine of high

TENNIS PLAYED ON ICE.

This was a favorite pastime of one of New York city's clubs last season. It promises to be even more popular this winter.

type. Then she will go into the Panama trade.

The day of the sailing vessel is about over—or nearly so. Shippers these days are demanding quick cartage of freight and the proud old sailing vessels which for centuries had been masters of the sea are giving place to the steam-propelled ship. The majestic old *Phelps* is one of the unfortunates that have been hard hit by the development of steam engineering.

The *Phelps,* on her last voyage, is after a record. She already has to her credit speed records by the score but her master, Captain Curtis, says he wants to make the last trip around the Horn a memorable one and he is going the limit, as far as speed is concerned. She has already made passages around Cape Horn in seventy-seven, ninety-five, ninety-six and ninety-seven days. On the Cape Horn passage, 125 days is considered a good run.

Sailing Vessel That Is to Become a Steamer—the *Erksine M. Phelps.*

MOTORCYCLE AMBULANCES FOR ANIMALS

EUROPEAN civilization has been relatively slow in realizing the necessity for a sufficient protection of animals. The movement for the prevention of cruelty to animals has however made powerful strides during the last few decades and animals' hospitals have even been installed at some places. Of these institutes, which are not yet sufficiently known outside their limited circle, none has done so beneficent and at the same time comprehensive work as the Animals' Hospital and Institute in London which, at the same time, serves as refuge to animals abandoned in the streets.

Board and lodging are provided free of charge to animals whose masters are no longer able to keep them, and they are housed until good and suitable homes are

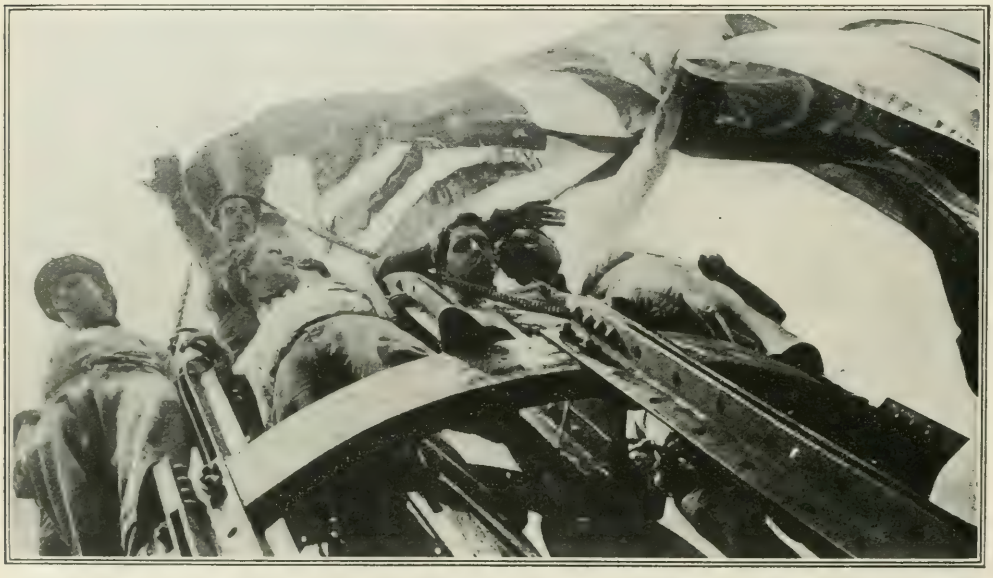
MOTORCYCLE AMBULANCE FOR ANIMALS.

A GAME OF AMERICAN BASEBALL IN THE CITY OF BERLIN.
The umpire, it will be noted, is accoutered in armor, and carries a spear. This is a wise precaution our umpires at home might well adopt.

found. Stray or lost dogs and cats are received and looked after until claimed; everything is done to find out the owners, but if these cannot be discovered, good homes are sought for the foundlings.

An interesting feature of this animals' hospital is the motor ambulance which, in conjunction with two motorcycle ambulances, calls for animals their owners cannot bring to the hospital.

These ambulances also do good service in taking up from the street animals which have met with an accident. Posters are displayed throughout London and the surrounding districts, stating the assistance which is given at the hospital and urging people not to turn their dogs and cats adrift but to bring them to the Institute or to have them called for by its ambulance, which is ready for service at all reasonable hours.



HOISTING THE AMERICAN FLAG ON THE WOOLWORTH BUILDING, NEW YORK CITY'S LATEST AND LOFTIEST STRUCTURE—FIFTY-FIVE STORIES HIGH.
The photo was taken below the group.

TRACKLESS TROLLEYS IN AMERICA

By

HENRY JEVONS

"THE trackless trolley, with wires overhead, has already been adopted at numerous places in Europe, and there are hundreds of communities in America that could be benefited by such a service. . . . The subject is already receiving very serious attention, and many such installations may be looked for in the near future."

In these words the National Electric Light Association was informed by its Committee on Progress at its annual convention at Seattle during the summer that a method of transportation which has been developed abroad has at last reached a nation that prides itself on its progressiveness.

One trackless trolley line is already in operation near Los Angeles, running a sixteen-passenger car between Bungalow Town and a station on the Los Angeles and Pacific Railroad, while negotiations for franchises are under way in Queensborough, Greater New York, Summit, New Jersey, and a score of other places from Pennsylvania to Colorado. If the experience of England affords any basis for prophecy a trackless trolley craze may soon be expected.

On the strength of reports by sundry engineers fifteen bills for trackless trolley lines were deposited at the private bill office of the House of Commons in November, 1910, while in November, 1911, eleven more bills for trackless trolley lines in as many different localities were deposited. Last spring two more lines were opened, at Dundee and at Rotherham. The City of Edinburgh has sent a commission to inspect the Leeds and Bradford lines which has made a favorable report on the new system, while the London County Council and the Metropolitan Electric Tramways Company are conducting independent investigations with a view to introducing trackless trolleys into the Metropolis itself, where the motor 'bus has been more or less successful in meeting the demands of traffic, but has been rather unprofitable for the stockholders.

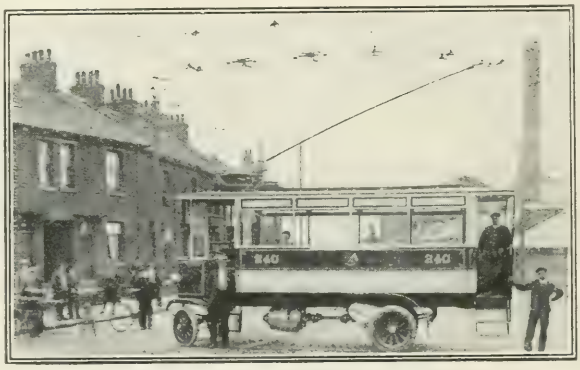
In fact, the trackless trolley seems to have dawned upon the whole English speaking world all at once, for the Bloemfontein, South Africa, town council, has just authorized the installation of a line, and Krugersdorp is considering the matter, while various places in Australia took up the idea about the same time that it reached America.

TRACKLESS TROLLEY COACH DRAWN UP AT THE CURB TO TAKE ON OR DISCHARGE PASSENGERS.

On the continent of Europe the trackless trolley for freight and passengers is an old story. One line has been in successful operation at Gravenbruck, Westphalia, since 1903, while installations at Vienna, Dres-

den, Bremen, Drammen, Norway, Spezia, Italy, Lyons-Charbonnieres, France, and thirty other places, are all earning dividends and pleasing their patrons at the same time. Italy, alone, has fifty miles of trackless trolley lines.

Considering that the trackless trolley is nothing more nor less than a combination of the automobile and the trolley car, both of which have been very extensively tried out in daily service under all conceivable conditions, it seems strange that the combination is not in much more general use. The idea of making such a combination is old enough. Siemens and Halske fitted up an ordinary omnibus with a trolley running on an overhead wire in Germany thirty years ago. About the same time the Compagnie de Traction par Trolley Automoteur in France fitted up a trackless trolley motor carriage designed by Bonifiglietti and Lombard-Gerin. A little later an American named Short also tried to run a trackless trolley. None of these early ventures was commercially successful, though they worked well enough to indicate that success might be attained when details were properly developed.



Trackless Trolley Rounding a Loop

Since then four different systems have been developed successfully on the continent of Europe. The oldest of these is the Max Schiemann system, brought out in 1900, and now in operation in fourteen places, including Drammen, Norway, a town of 35,000 inhabitants, Munich, Mulhausen, Monheim and Wurzen, Germany, and near Los Angeles.

As there is no rail for the return current, and as the cars are insulated from the earth by their rubber tires, any way, two wires, one positive, the other negative, are required for all trackless trolleys. Another feature possessed in common by all is that for lines with light traffic the cars are provided with a single entrance at the front end so that the driver may collect fares, thus saving the wages of a conductor; while on lines with heavier traffic a rear entrance presided over by a conductor is provided. No double deck cars have yet been built, though that style has been proposed for some of the English lines now under way.

A third feature common to all trackless trolley lines is that for heavy traffic two pairs of wires are provided, making the equivalent of a double track railroad. For lines with lighter traffic a single pair suffices. The single line trackless trolley possesses the great advantage over a railroad that there is never any waiting on sidings for delayed cars. Cars moving in opposite directions simply keep on going until they meet. If they happen to be equipped with trolley booms, or poles, one car pulls down its pole and keeps right on under its own momentum till past the other car, no stop being required. If a cable is used the cars stop wherever they meet long enough for the drivers to pull the cable plugs out of their sockets and exchange trolleys, an operation requiring from eight to fifteen seconds.

In the Schiemann system the wires are usually placed six inches apart and seventeen feet above the ground. There are two trolley poles arranged tandem, with a sliding trolley, or current collector, running underneath the wires. A single motor of fifteen to twenty-five horse power under the driver's seat furnished the power by means of a longitudinal shaft and spur gearing driving the rear wheels. The Munich cars are capable of a speed of twenty miles an hour, while the car on the Los Angeles line can develop a speed of twenty-five miles an hour. On the latter line there

is a grade of twelve per cent up which the car runs eight miles an hour.

The Mercedes-Stoll system is now in operation on nine routes in Austria, Hungary and Bohemia, including four routes in Vienna, the first having been opened in 1907. In the Mercedes-Stoll system the positive and negative wires are placed twelve inches apart, twenty-one feet above the ground. The current collector is a four wheeled trolley weighing twenty-five pounds running on top of the wires. A weighted pendulum keeps the wheels pressed down on the wires and at the same time throws the center of gravity so low that the pull of the trolley cable will not displace the wheels. As a further protection against displacement safety hooks are provided above and below on both sides. Instead of a trolley pole a cable is used. A loop in the cable held by a spring absorbs sudden jerks on rough ground while a spring drum on the car roof takes up the slack. By providing the necessary cable a car can run a hundred feet away from the wires, if desired, though the usual length of cable is about thirty feet. There is a joint in the cable in reach of the driver's hand that may be separated by a single movement when making an exchange of trolleys upon meeting another car. Should the cable become fouled on an obstruction it parts automatically at the joint, thus preventing damage. There are two motors of twenty horse power each, one in the hub of each rear wheel. These motors are fixed securely on the axle and hermetically sealed. One eighteen-passenger car with this type of motors in service at Gmund, Austria, ran more than one hundred thousand miles without receiving any attention.

A Wide Radius of Action Is Permitted to the Trackless Trolley in Passing Other Vehicles.

The Lloyd-Kohler system is in operation on two routes, each two miles long, in Bremen; on a route eight and a half miles long at Ludwigsburg and on a route at Breslau. Several other routes are now being installed. The distinctive feature of this system is that the negative wire is placed above the positive instead of beside it, thus protecting the latter from possible contact with falling telephone or light wires. It is claimed that the trolley is less likely to be displaced on wires arranged in this way.

More than fifty miles of trackless trolley routes on the Filovia system are operated in Italy by the Societa Trazione Elettrica, including one route of fifteen and a half miles between Ivrea and Cuorgne. One route has been in successful operation for ten years. So highly is the trackless trolley esteemed in Italy that the government pays a subsidy of three hundred dollars a mile for routes in territory not already provided with tramway or railway service. On the Intelvi Valley line an additional subsidy of sixteen hundred dollars a year is paid for carrying the mail. On this line from Lake Como to St. Fidele the trackless trolley has demonstrated its remarkable capacity as a hill climber. The entire distance of five and a half miles lies up a mountain side at an average grade of six per cent, with a maximum grade of thirteen per cent. On the down journey the cars coast the entire distance without once turning on the current, the brakes being kept cool by water carried in a tank on the roof.

In the Filovia system the current col-

lector, or trolley, is a four wheeled truck running underneath the wires and held in place by a boom which presses the wheels against the wires with a force of twelve pounds. The car can run ten feet from the wires. The cars seat twenty to twenty-four passengers and have two motors of fifteen horse power each. The wheels are of steel with ball bearings and solid rubber tires.

Once the attention of England had been attracted by the trackless trolley a procession of investigators streamed over to the continent in search of information on the subject. In the crowd were representatives of a corporation which later developed "Railless Electric Traction," a system differing from all the foregoing.

In the United States still another system has been brought out. The principal feature of the American system is the four motor, four wheel drive, a system that has been long in use on storage battery trucks for heavy duty, thus making all of the wheels drivers instead of only the two rear wheels as in all other systems. Experience in actual service has shown that this obviates slipping and skidding, while it also decreases the liability to break down. If one or two of the motors fail the car may be run temporarily with the remaining two, while the wheel with its motor can be removed bodily and another combination put on in a few moments. Another feature is a sliding bow trolley running underneath the wires. The car itself has been Americanized in appearance, enlarged to accommodate from thirty-two to forty passengers and arranged in accordance with American ideas of comfort and convenience, which differ materially from the European notion.

What Sophocles Says

¶ The dice of Zeus fall ever luckily.

¶ Nobody loves life like an old man.

¶ Thoughts are mightier than strength of hand.

¶ The truth is always the strongest argument.

¶ War loves to seek its victims in the young.

¶ It is better not to live at all than to live disgraced.

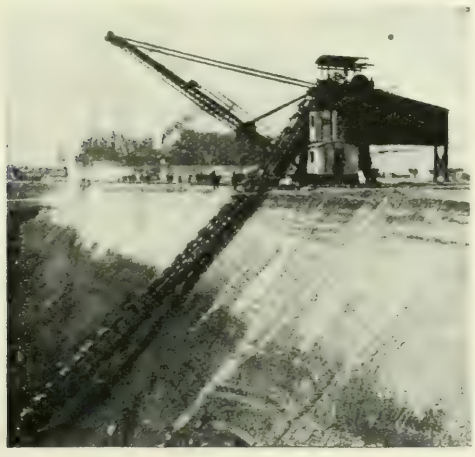
French Method of Cleaning Buildings.

FRENCH METHOD OF RENOVATING STONE

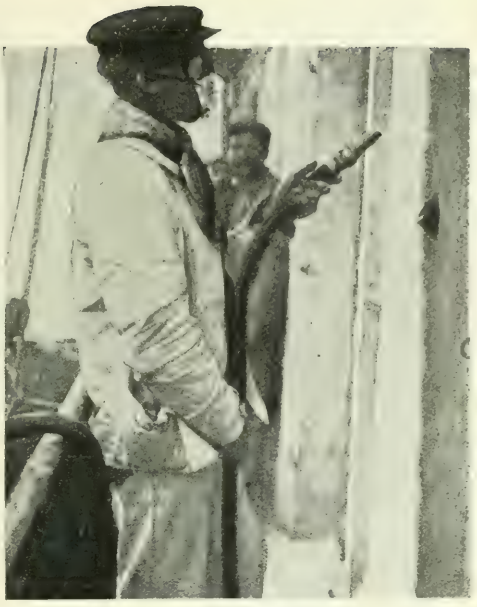
RECENTLY in Paris a new method has been introduced for the renovation of stone buildings which have become dingy from long exposure to the elements. Previous to the invention it had been a very difficult matter to restore stone to its original color.

By the new method, first the dust, in all the crevices of the stone, is slightly loosened and then removed by means of an apparatus acting upon the well-known vacuum cleaner principle. This is followed by the ordinary sand blast which forces through the hose a combination of air and very fine sharp sand.

Just behind the workman is a huge cloth funnel which catches all the excess sand from the blast and returns it to the collecting apparatus in the street below.



New Endless Chain Arrangement as It Is Used in Germany.



The Worker.

ENDLESS CHAIN DREDGE

THE type of dredge shown in the accompanying illustration is remarkable in that it is distinctly different from others heretofore manufactured, having a series of chain scraper buckets arranged one after the other in a parallel line. Its length is about 110 feet.

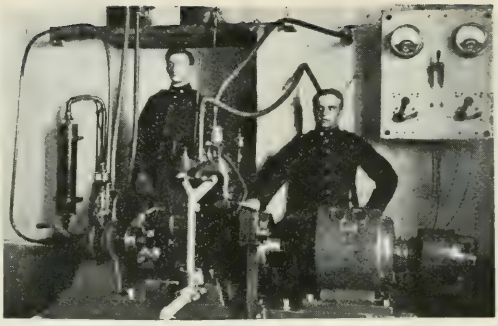
This special type of construction has been brought out by a German firm and has been adopted in cement factories Owing to the class of work it is called upon to do—working in light moist loam or clay and sand—its construction is of a very light material.

One particular advantage, aside from having the endless chain arrangement of scraper buckets, is the fact that on the scraper side of each separate bucket or cup a knife blade is located. This is adjustable and can be removed for sharpening or replaced by another knife.

The counterpoise or balance for the extremely long arm of the dredge is made of paving stones and weighs forty tons. The cut of the dredge is of course rectilinear. It cuts to sixty-five feet.

As the moist loam is scooped up by the endless chain of knives it is carried into a funnel-shaped chute in the engine house and there deposited in carriers and forwarded to the cement factory.

HAND-WRITING BY WIRELESS



BEROOCHI'S SENDING STATION.

FRANCESCO DE BEROOCHI, WHO HAS TRANSMITTED HANDWRITING BY WIRELESS.

THOUGH endeavors to transmit handwriting, drawings and photographic pictures were made in the early stages of telegraphy, in fact about half a century ago, the first satisfactory results, suitable for the purposes of the illustrated press, have only been recently obtained. Some inventors have now set themselves the task of effecting a transmission of this kind without the intermediary of any telegraph wires, i. e., by the aid of electro-magnetic waves as used in wireless telegraphy.

A young Italian inventor, Francesco de Berocchi, of Turin, has recently succeeded in producing a satisfactory wireless transmission of handwriting, drawings, etc., to a distance of over one hundred miles between the military radio-telegraphic stations of Turin and Milan, placed at his disposal by the Italian war department.

The new apparatus can be used in connection with any existing radio-telegraphic installation, using at the sending station the wave generator and at the receiving station the wave detector. An especially valuable feature of the new scheme is its

THE WIRELESS RECEIVING STATION.

absolute secrecy, depending on periodical variations in transmission in accordance with synchronous periods of electric waves. The motion of the receiving cylinder is kept synchronous with that of the sending cylinder by means of electric waves, any difference being compensated immediately by the very waves used for transmission.

Though this wireless transmission was sometimes disturbed by the working of other wireless stations, or by heavy atmospherical discharges, perfectly clear reproductions at the receiving station could be obtained.

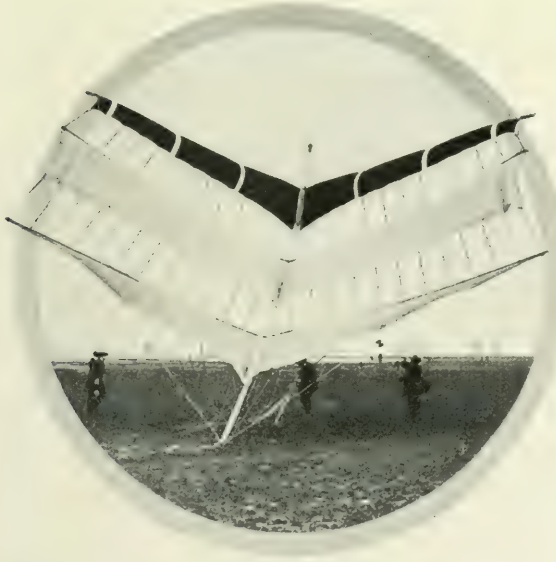
HERR WEICHERT SUSPENDED FROM HIS FLYING KITE.
It has, in tests, raised three persons together to a height of forty feet.

VACUUM TIRE TO DISPLACE PNEUMATIC

SINCE pneumatic tires were first fitted to wheels and their superiority in point of resilience over solid tires demonstrated there have been many attempts to build substitutes for the air cushion in order to overcome the objection of punctures and blow-outs. The trouble with all these substitutes, according to the inventor of a new vacuum tire, is, that eliminating air permits the tire to be only as elastic as the material from which it is made. The tire depending upon the compression or expansion of a solid can never compete with a pneumatic tire, since the air has no elastic limit.

With these principles in mind the inventor has turned out a vacuum tire, a cross-section of which is shown in the illustration.

The difference between the tire shown and others is that in this one the air is pumped out of it (instead of being put into it) under pressure.

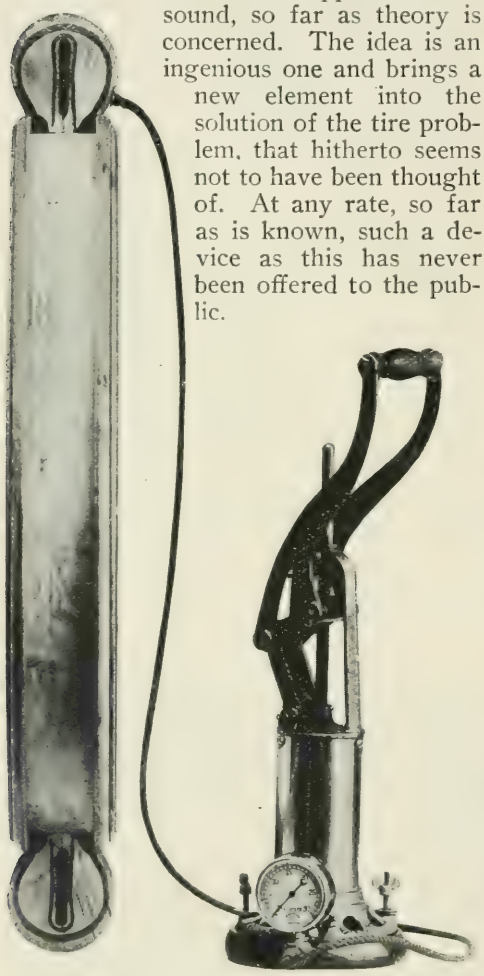


REMARKABLE KITE. INVENTED BY A BERLINER, HERR WEICHERT
Its parts can be assembled in ten minutes' time ready for flight, and it will carry passengers. It is hoped that it will prove useful for military spying.

The air chamber, or, as it might better be called, the vacuum chamber, for very little air remains in it after the pumping operation is completed, is half an inch wide and two and seven-eighths inches long, when no pressure is exerted upon the exterior other than that of the atmosphere. When the weight of the car is applied, however, the chamber tends to widen in the middle and this tendency is resisted by the pressure of the atmosphere exerted on the outside of the tire. According to the inventor, the vacuum tire, like any pneumatic tire, depends for its resilience upon the elasticity of air and yet blowouts are impossible, for the pressure is all upon the outside of the tire.

Punctures, although not impossible, need not necessarily cause delay, for there is sufficient

rubber in the construction of the tire to be used as a cushion tire, even when air enters the interior. The heating effects, it is also claimed, are not so much in evidence, for, the rarification of the air, as each shock is encountered, tends to cool the tire. The principle on which this tire is constructed appears to be sound, so far as theory is concerned. The idea is an ingenious one and brings a new element into the solution of the tire problem, that hitherto seems not to have been thought of. At any rate, so far as is known, such a device as this has never been offered to the public.



Airless "Pneumatic" Tire Attached to Pump.

Many attempts have been made to invent a substitute for the pneumatic tire as used on automobiles and bicycles, but always something was lacking. Flexible springs, to take the place of the cushion of air have been tried out. Substitutes for the rubber material itself have been offered, but not one of these has proved satisfactory. The airless "pneumatic" promises to be more successful.

A Freak That Lived but Four Days.
A two-legged horse born on an Ohio farm.

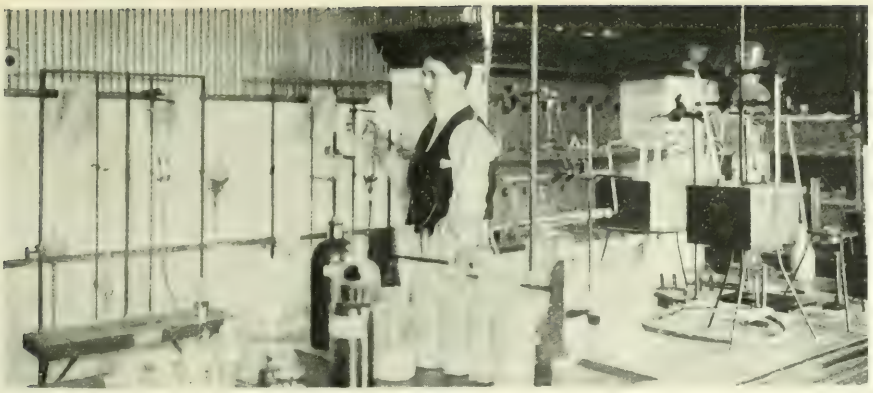
HORSE WITH TWO LEGS

A MOST unusual freak in the form of a colt lacking front legs was born near South Solon, Ohio, recently. The animal is well formed in every other respect, nature having apparently made compensation in other ways for this remarkable deformity with which she had afflicted the little creature.

The hind legs are exceptionally large. There is no shoulder blades and the curvature of the spinal column seems to have been especially designed for the attitude in which it is herewith shown in the illustration.

During the four days it lived the little equine seemed to be healthy and active and is said to have walked about on its hind legs as if nature had intended it to do so.

The colt, about five feet in height, has been mounted in the attitude in which it was seen walking about by the hundreds of visitors who flocked to the farm where it was born.



THE MODERN LABORATORY, WHERE MAN HAS EVOLVED SYNTHETIC RUBBER TO RIVAL NATURE'S FOREST PRODUCT.

SCIENCE MAKES ARTIFICIAL RUBBER

By

R. G. SANFORD

IF Nature's rubber product be subjected to distillation, an oily, highly-volatile hydrocarbon is extracted, and this elusive fluid is known to the technical world as isoprene—the very base of natural rubber.

Analysis, as all of us know, is that process of separating the components of anything, discovering the number of them and the proportionate part each takes in the composition. If, with this knowledge, we gather these various materials from other sources and mix them together in accordance with what we found out by analysis, this becomes synthesis. Synthetic rubber, of which we have heard so much recently, then is an artificial reproduction of caoutchouc after the chemist has discovered the very foundation of the natural product of the tropic forest. But how is the organic chemist to make isoprene from a source other than native rubber? It was necessary to find a way to make isoprene and, at that, chemically pure isoprene. To be of any commercial value the process should be simple and the raw materials cheap and abundant.

Quite twenty-five years ago, the noted chemist Kondakow produced synthetic isoprene, but he was able to make but a trifling quantity of it—merely a laboratory performance, and the stuff was so volatile that it disappeared in vapor upon being poured from one vessel into another. There was not enough of it available to carry the experiment further. Some means had to be discovered by which the chemist should have at his disposition fairly large quantities of this fundamental hydrocarbon. Dr. Fritz Hofmann, a noted German chemist, set about solving this problem.

To begin with, Dr. Hofmann learned from the existing chemical text books, when he began his search for a process to make synthetic rubber a few years ago, that there were recorded at least fifty different formulae for the production of synthetic isoprene. But alas, his laboratory tests proved substantially all of these to be at fault. However, one of them gave him a suggestive lead. This was a distillation from coal, and, as a reward for two years of patient and persistent labor, Dr. Hofmann and an asso-

ciate succeeded, early in 1909, in making several litres of pure synthetic isoprene —apparently the first time any large quantity had thus been obtained.

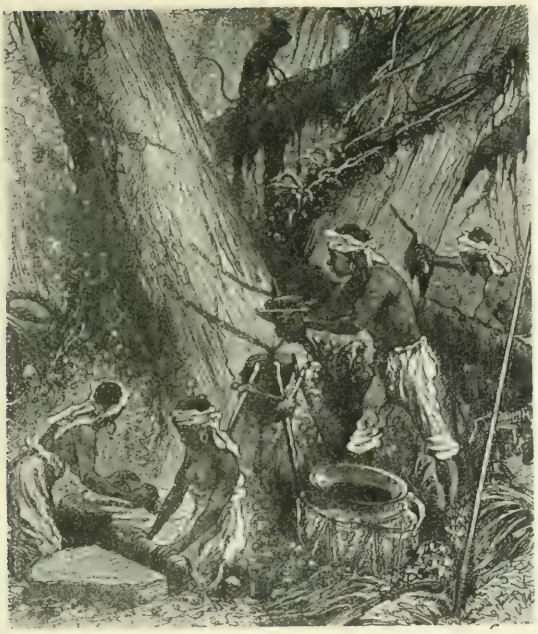
That was a notable accomplishment, but the organic chemists were still a long way from the edge of the woods. How were they to convert the liquid into the solid, elastic state of real rubber? To be sure, the text books quoted earlier eminent authorities upon this point, but following that guidance the results were utterly discouraging. It had been said that the mere action of light would turn isoprene into a rubber-like substance. Dr. Hofmann put some of his isoprene in a glass vessel and exposed it to light for eighteen months. At the end of that time the fluid was no thicker than thin syrup. No commercial success could follow from these results as they stood. Dr. Hofmann and his associates tried every medium—physical and chemical—that they thought might coagulate the isoprene, but it would not thicken.

The goal, however, was not far away. By chance, heat did the trick, but heat applied in an unusual way. Others had resorted to heat, but the most successful had obtained nothing better than a resinous substance. The secret lay in using heat in combination with pressure, and by this process the isoprene became a veritable physical double of the tree-born caoutchouc.

The Gutta-Percha Plant, Flower and Fruit. Gutta-percha is a near relative of India rubber. It is especially serviceable for insulating purposes.

The India Rubber Tree of South America.

In speaking of his work, this eminent chemist says: "It is not too Utopian to assume that the way in which we have gone about the making of artificial rubber is the same that Nature, herself, follows in the plant. It is true, that isoprene, as such, has never been traced in vegetable matter; but if one will consider that there are agencies capable of transforming for the moment isoprene into other substances—keeping in mind the wonderful manner in which the cellular structure of plants works with gases and other volatiles, it will no longer be right to declare that natural rubber is not possibly formed by the action of heat upon monomolecular carbohydrate. It seems to me that the assumption that isoprene is primarily created in the rubber-yielding plant, and then converted into rubber by the polymerizing influence of the sun's heat, is warranted. Perhaps also there is a decomposing process in the living cells of the rubber tree which is still unknown to us, and this action pos-



THE JUICE OF THE GUTTA-PERCHA TREE BEING DRAWN AND GIVEN ITS FIRST ROUGH TREATMENT IN THE FORESTS OF THE FAR EAST.

sibly transforms Nature's isoprene into the latex or juice of the gum tree as we know it." Polymerization is the process by which the atoms of a substance, without changing their chemical proportions, are made to arrange themselves differently: polymerization, in this case, altering the fluid isoprene into a material of rubber-like consistency and characteristics.

The German scientists are drawing their mother substance for isoprene from coal, and by processes which are said to be commercially practicable, this cheaply-made isoprene can be converted into synthetic rubber at a moderate cost —a cost which it is said will fairly approximate the expense of gathering and the first treatment of the latex in the forest. Further, Dr. Hofmann has had his synthetic rubber searchingly tested by disinterested chemists and physicists, and they have proclaimed this artificial caoutchouc to be in all particulars a counterpart of veritable India-rubber.

In England, the isoprene is obtained from such starchy vegetables as corn, potatoes, etc., and then by subsequent chemical manipulations converted into a rubber-like material. Isoprene, like oil of turpentine and other hydrocarbons, has approximately the following composition:

Carbon .....88 per cent
Hydrogen .....12 per cent

The British artificial caoutchouc is said to contain one atom less of carbon than Nature's rubber, and some chemists declare that this seemingly trifling difference may affect the value of the synthetic product. But whether this prove to be correct or not, the thing that is of most interest to the layman is that isoprene, the very foundation of Nature's rubber and man's latest achievement in organic chemistry, can be made either from coal or from cereals and other vegetables. This shows us how, after all, the basic elements are relatively

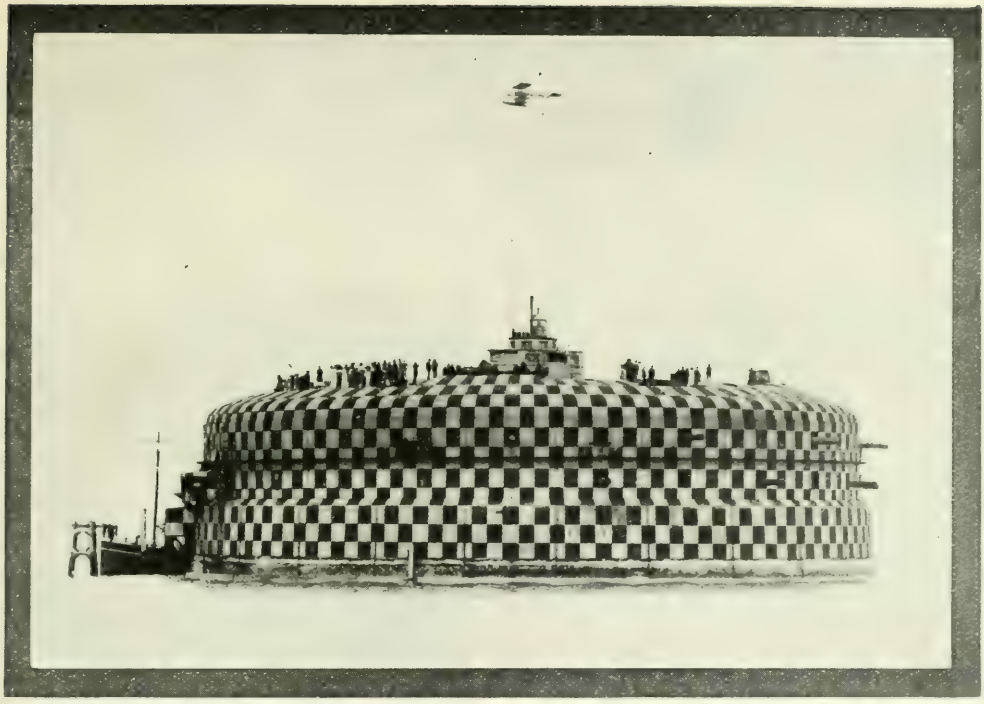
GATHERING THE JUICE OR LATEX, OF THE RUBBER IN THE AMAZON FORESTS.

few that go to make up this world of ours and all that flourishes upon earth.

Even if synthetic rubber be not absolutely identical in all of its characteristics to the caoutchouc of the tropic forest, still this new material will be of great commercial and practical value if it can be made at a reasonable cost—as both the German and the English authorities assure us. It may be that synthetic rubber will be even better for some purposes than natural rubber, and it will be better because of physical differences—meeting special uses with peculiar fitness where natural caoutchouc would not answer so well, if at all. Broadly, it appears that the synthetic material is likely to equal a great many of the demands now made upon Nature's substance, and in doing this it is calculated to make us less dependent upon the rubber tree. It is not likely to put the rubber plantation out of business as synthetic indigo substantially did in the case of the indigo-plant, but it probably will make it possible to employ rubber—synthetic or natural—in many directions where comparative scarcity of caoutchouc now prohibits its application.

One of the heavy costs in marketing natural rubber is that of transportation to the points of manufacture; and another added expense is the after treatment in order to purify the stuff and free it of various objectionable foreign matters which have either accidentally or purposely been incorporated in the crude rubber by the native gatherers. Synthetic rubber, on the other hand, will be made in immediate touch with the manufacturing market and its preparation will be in the hands of skilled men. Thus the heavy outlays just mentioned can be avoided, and synthetic rubber, even if somewhat higher in price to the first purchaser than crude native rubber, would still be cheaper in the long run, which last factor is most important.

There is, nevertheless, a serious obstacle to the commercial success of artificial caoutchouc, and that is the disposition of the by-products left over in its making. Dr. Hofmann figures that he will get twenty-five per cent of synthetic rubber out of every one hundred pounds of raw material. He estimates the daily consumption of native rubber at something like five hundred thousand pounds; so very little figuring will show the measure of accumulating by-products. It is upon this aspect of the question that the German chemists are now devoting the greatest part of their attention. The scientists of the Fatherland have already given us many striking examples of their cunning in turning factory wastes into useful channels, and we can reasonably expect success in their present problem. The whole subject is both fascinating and complex, but once more we see what patience combined with science will do toward effecting revolutionary achievements in the department of organic chemistry. Organic chemistry has worked wonders already in the great industries of making synthetically sulphuric acid, indigo, soda, etc.; and all of these marvels serve only to give added force to the saying, "Science and Nature are but one."



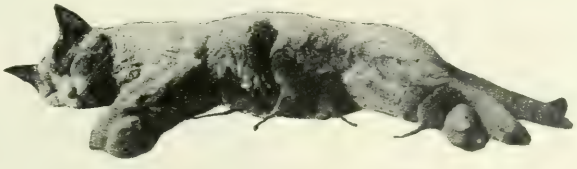
CURIOUS CHECKERBOARD-LIKE FORT AT SPITHEAD, ENGLAND.
It is built of concrete on a solid concrete-island foundation. Bomb-proof and bristling with guns all around, it has only one landing, which can be cut off from within. The checkerboard pattern is to conceal the positions of the cannon from an enemy.

NEW OUTFIT FOR DIVERS

IN the ordinary diving outfit, divers get their supply of air through a caoutchouc tube connecting them with the surface. This arrangement has the drawback of rendering the men working in the depth dependent on a rather complicated apparatus as well as on the services of those installed on the shore or on board ship. A successful attempt to remedy this state of affairs and to design a self-contained diving outfit has been made by a native of Germany. The apparatus is based on a principle similar to the respiration apparatus designed for rescue work in mines, etc.

In a regenerator carried on the back, the air, circulating through the helmet and suit of the diver, is purified automatically and regenerated by an addition of oxygen. The amount of air thus placed at the disposal of the diver, is from 60 to 70 litres per minute and 3,600 to 4,200 litres per hour, and suffices for even the most exacting work.

The regenerator comprises some steel cylinders filled with compressed oxygen, a potash cartridge and a circulation device—suction and pressure nozzle and pressure reduction valve. Two short lengths of hose connect the helmet with this regenerator; one of them serves to draw off any used-up air, while the other at the same time supplies fresh air. After having been started by means of a readily working valve, the apparatus will work for from two to three



THIS CURIOUS SIGHT MAY BE SEEN AT HAMILTON, OHIO.
Eight tiny rats given to the cat "Maria," instead of being eaten, were disposed of by her in the manner shown in the illustration. "Maria" washes her adopted children, coddles them and, in fact, treats them in every way as if they were kittens.

New Outfit for Divers.

hours, in accordance with the amount of carbonic acid that is given off by the individual.

The usual lead weight carried on the chest is replaced by steel bottles containing compressed air or oxygen. In order to reach the surface without any outside help, the diver only has to open a valve, thus causing air to flow from these bottles into his diving suit and to impart to it the required buoyancy. The helmet consists of an elastic caoutchouc fabric protected by a metal cover against mechanical damage and yields most readily to any sudden increase or reduction in pressure as produced by a variation in depth. A telephone allows the diver to communicate with the outside world, the telephone conductor and signaling cord being combined into a safety cable for hauling the diver to the surface in case of emergency.

The invention is one of the many that are being turned out today to safeguard those men who are obliged to risk their lives in hazardous occupations. Especial attention, since the submarine boat became a necessary auxiliary to every navy, has been directed to under-water protective devices. And nowhere than beneath the waves of the ocean are such safeguards more essential.

FOR NIGHT WORK AMONG THE WIRES

PROBABLY the most disagreeable as well as the most dangerous task that falls to the lot of the lineman is night repair work upon electric light wiring. His inability to see properly multiplies his difficulties greatly and in order to over-

For Night Work Among the Wires.

THROWING A TRUNK FROM ROOF TO PAVEMENT TO PROVE ITS STRENGTH.

come this a member of the staff of an Indiana electric light company has devised a hand searchlight which is shown in the illustration.

The outfit consists of a small gas tank and lamp, such as are used to furnish light for motorcycles, and a special harness fitted to the lineman's shoulders for conveniently carrying the equipment.

The lamp is fitted with a handle by which it may be carried and its light directed upon the work. It is connected to a gas tank by means of a small rubber tube. When the supply of gas is exhausted, the tank can be removed from the harness and exchanged for a new one at small cost.

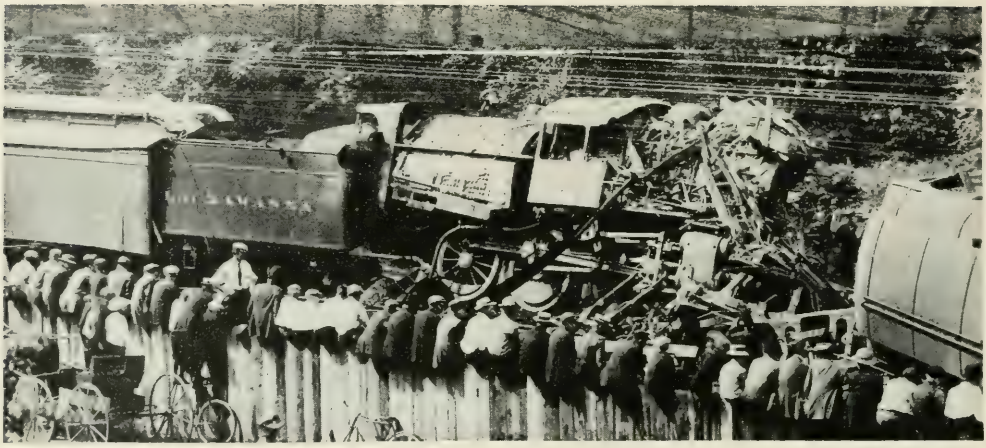
It is asserted that the outfit is especially valuable in locating pole troubles, fallen wires, etc., and is so light and compact that it can be carried by a lineman without interfering with his work.

The maker gives the original cost of the outfit as follows: Gas tank, $10; lamp, $4; harness for carrying, $2, making a total cost of $16.

UNIQUE TEST OF A TRUNK

AN agent for a certain make of trunk that is claimed to be practically indestructible, was planning a demonstration to prove his claims. The manager of the department store with whom he was chatting remarked, "Take a trunk up on the roof and throw it off. That will show the public." The remark was not made seriously, but the agent took it up. The next day he arranged with the contractor who was building an addition to the store to hoist one of his trunks on a derrick to a point about fifty feet higher than the roof and drop it into an excavation. The total distance was more than 200 feet and when the trunk was cut loose it hit the ground like a cannon ball. A photographer had been engaged to catch its picture in mid-air, and also to photograph it immediately after it landed, and the latter picture shows that it was hardly injured by the tremendous jolt that it received on striking the pavement.

OVER THE SANDS BY WIND POWER.
This craft, the invention of a clever Dutchman, at Scheveningen, Holland, is shown under full sail on the shores of the North Sea.



WHERE STEEL PROVED ITS SUPERIORITY.
A railroad wreck that showed the inadequacy of wooden cars.

"AIR WASHED HERE"

THIS little machine certainly ought to find a place in every office, factory or place where a large number of people are congregated or work together. This machine does nothing more nor less than wash the air. The air, drawn in through the water in the instrument, passes out washed free of all dust and contamination. Ice in the water will cool the air in summer. Only a few drops of perfume will render the atmosphere fragrant as with many flowers. A few drops of disinfectant will turn the vitiated air of the workshop into the fragrant breath of the forest. All one has to do to prepare the machine is to connect it up with any ordinary electric lamp holder and fill the glass bowl to the marked water line.

These are the claims, at least, of the manufacturers of this rather unusual device. If their claims are in any wise substantiated the invention should prove a tremendous boon to mankind. Bad air, it is declared, has been responsible for more deaths from pneumonia and tuberculosis than all other causes combined. The air even more so than the blood, "is the life," for pure blood depends upon the purity of the air inhaled.

WOOD VERSUS STEEL CARS

ON the morning of last Fourth of July some forty people were killed in a wreck, just east of Corning, N. Y. One passenger train, going at a speed of sixty-five miles an hour, struck the rear end of another passenger train which had been stalled by an accident to a freight train ahead.

The rear, wooden coach of the train so struck was ploughed right through by the locomotive. But the next car, being of steel, showed more fight; and

"AIR WASHED HERE."

SIX TRAIN LOADS OF COAL FROM PITTSBURG TO NEW ORLEANS.

though one end was broken in it did almost as much injury as it received to the oncoming engine, and was not crushed but was turned over.

Nearly all of those killed were in the rear coach, only three in the steel one, and a few more in the third from the rear, which was of wood and badly broken up.

THE FIRST MOTOR GONDOLA

THIS boat is a forty foot Venetian gondola. It is equipped with an electric motor and storage batteries, giving a normal speed of seven and one-half miles an hour with a maximum speed of nine miles an hour. In workmanship it is probably one of the handsomest boats ever turned out, and is constructed of Indian teak and African mahogany.

Commodore Bourne, of the New York Yacht Club, its owner, had thought to have this boat built in Venice, but on the assurance of an American concern had it built in the United States.

That the gondola should be built in strict accordance with all the technical traditions, which have been handed down from the early ages of the doges, some dating back to the eighth century, the builders made exhaustive research of all that has been written pertaining to these ancient craft, down to the examining of old prints. The anachronistic electric motive power has been skilfully concealed, so that the boat silently glides along as though propelled by some ghostly gondolier of the romantic days of long ago.

VENETIAN GONDOLA AS MOTOR BOAT.

BOAT TIME BEATS TRAIN TIME

THE tug *Sprague* plying between Pittsburg and New Orleans, brings coal to the latter city. The Ohio and the Mississippi rivers provide the open waterway through which this tug conducts such a fleet of coal barges as have rarely been tied together since time began. This single vessel, requiring the attention of but two or three men, can pull the equivalent of six train loads of coal. So greatly simplified is the task of transporting this bulky and heavy freight that the expense of the haul is seventy per cent. less than it would be if it were made by rail. It is shown, also, that the actual time consumed in thus transporting coal by barge is less than by rail, for the reason that the barges in tow go steadily on while slow freight by rail is prone to get on the side track and stay there for an indefinite length of time, as unfortunate shippers are too well aware.

BOOM IN SHIPBUILDING

By

CHARLES FREDERICK CARTER

THOSE who like to feel discouraged over the sorry plight of the American Merchant Marine will have to find something else to worry about. It is undeniable that the American merchant marine has been in a bad way for years. Pessimistic editors have wept barrels full of ink over its deplorable situation. But it is a long lane that has no turning. Quite recently the American merchant marine mustered courage to consult Old Dr. Spondulix, of Wall Street; and after taking a few bottles of his justly celebrated financial panacea the patient is feeling so fine that it is now doing a cake walk, punctuated by handsprings, in the opposite direction from the Slough of Despond.

It is hard to have to cork up one's enthusiasm over so cheerful a subject and discuss it with decorous dullness; but as a sop to the Gradgrinds a few facts may be stated in the most uninteresting way possible.

From January 1 to June 1, 1912, orders for one hundred and ten steamships of various classes were placed with American shipbuilders. If that does not take your breath away, be pleased to hear, further, that an American steamship company trading with the Hawaiian Islands last winter placed orders, at one fell swoop, for steamships aggregating eighty thousand tons. Such a large order is unparalleled in the annals of American shipping. If you are still unruffled, you are hereby informed that all the big shipyards are so busy that some, at least, find it difficult to get enough skilled workmen, while none can accept any more contracts for early delivery. So great is the pressure that vessels designed for ocean service are being built in shipyards on the Great Lakes. Now, if that doesn't feaze you, for Heaven's sake read something else that *will* stir you up!

THE *Suwanee*—A RECENT ADDITION TO OUR MERCHANT MARINE.

A COASTING VESSEL—FRESH FROM THE YARDS—AT NEWPORT NEWS.

But stay one moment! Since June 1 further important contracts for American merchantmen have been placed. These include a freight and passenger steamship of fifteen thousand

ONE OF THE BIG CRANES AND A PART OF THE YARDS AT QUINCY, MASS.

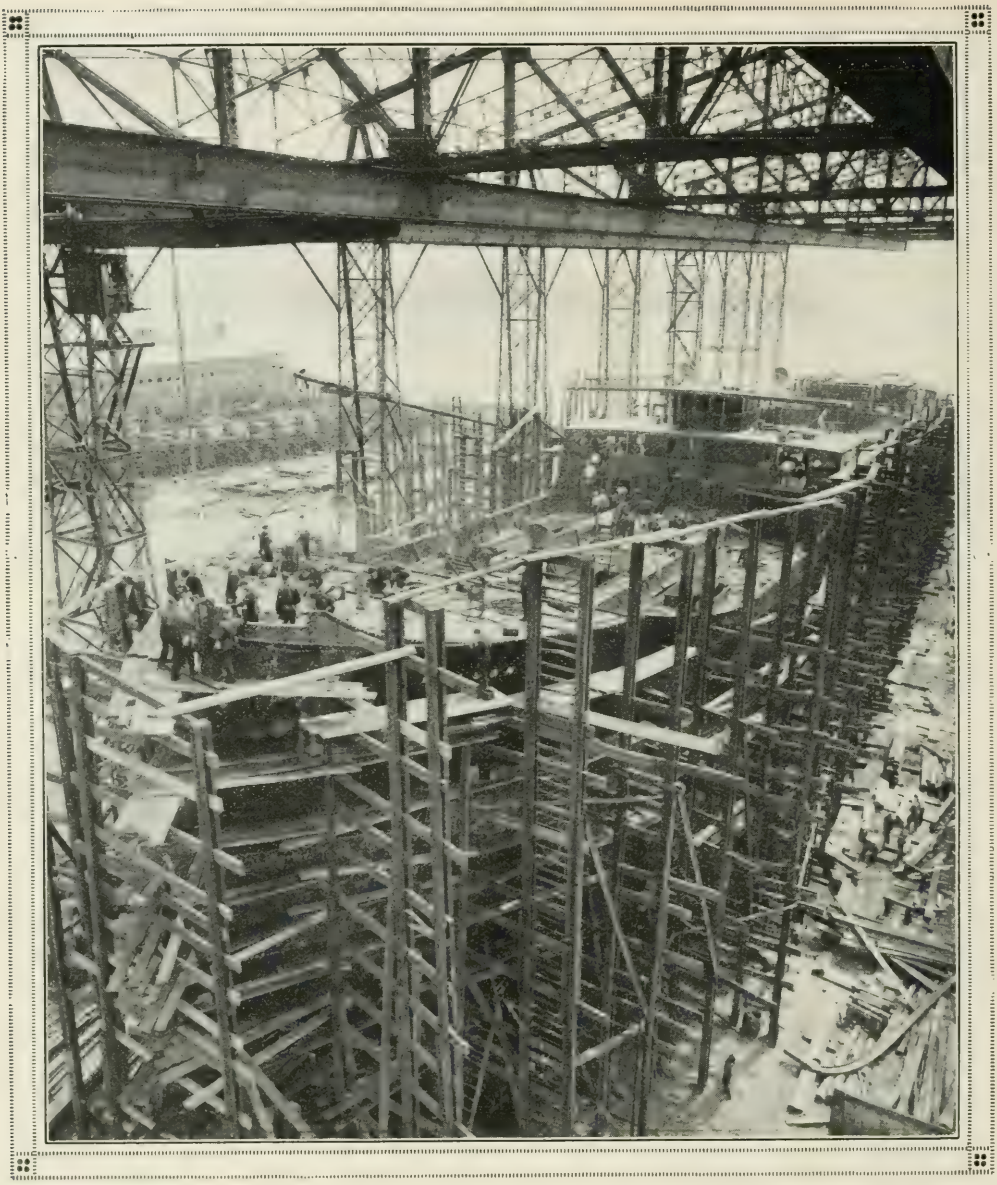
tons, to cost $1,400,000, for another big company, with ships to ply between San Francisco and Honolulu, and a steamship of eight thousand tons for a New York to Porto Rico company to help handle the swiftly growing traffic with that island.

Even this is not all. The naval architects have been obliged to forego vacations and work overtime through the hot summer days over designs for still more steamships. One concern is planning to build a fleet of seven fruit steamers. The Pacific Mail is planning to build four very large steamers if Congress will graciously concede it the right to be on earth. But no matter what Congress may do, the Red D and the Ward Lines, at least, will both place important orders for new ships just as soon as the naval architects can turn out the plans. Every steamship company in the country wants to increase its fleet immediately, if not sooner.

This is so sudden, and in such extraordinary contrast with conditions for some years past that it is hard to grasp. Now that we have turned about face and are trying to live down our maritime past, there can be no harm in admitting that the United States was the only nation that showed a decrease in the amount of shipping built in 1911 as compared with the preceding year. While little Italy showed a gain of 141 per cent in the output of her shipyards in 1911 as compared with 1910, Germany and France each a gain of 84 per cent, and Great Britain an increase of 55 per cent, we actually decreased our tonnage output by 23 per cent.

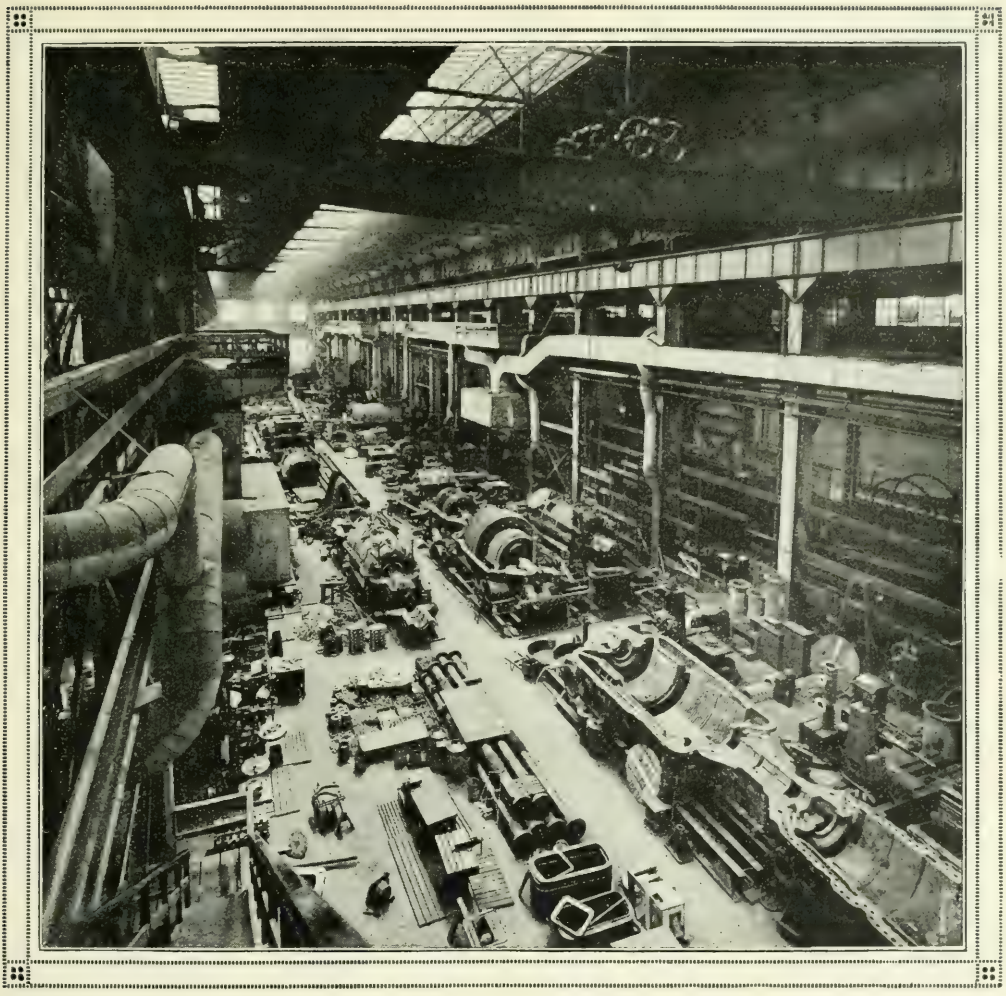
Not to abase ourselves too far, it may be as well to point out that percentages taken alone are apt to be misleading. Even if Italy did increase her annual output of ships 141 per cent while our tonnage decreased 23 per cent, we built more than three times the tonnage that Italy did. And we were also far ahead of France, notwithstanding her gain of 84 per cent. In fact we ranked third among the nations in the amount of shipping built last year. Or, omitting Great Britain, which is in a class by herself, since she built 2,080,397 tons, or nearly two-thirds of the world's total of 3,568,076 tons, we stand second on the list. Germany ranked next to Great Britain with an output of 401,881 tons as compared with 268,561 tons for the United States. France came next with an output of 184,411 tons. When it comes to tonnage owned we stand next to Great Britain and about seven hundred thousand tons ahead of Germany.

Shipbuilders are so busy these days they can't stop to talk about it; and if they do stop they grin with satisfaction



BUILDING THE STEAMSHIP *NELSON* FOR THE TRANSPORTATION OF MOLASSES IN BULK FROM CUBA AND PORTO RICO TO THE UNITED STATES.

so they can't talk any way. But from the published report of William Cramp & Sons, one of the leading shipbuilding concerns, it may be learned that the firm's business showed a decided improvement in 1911 over 1910, net earnings increasing $189,514, which may be taken as another indication that the American Merchant Marine is doing very nicely, thank you. The Cramps now have contracts in hand for seventeen craft of various descriptions. The Maryland Steel Company, of Sparrows Point, Md., has enough work on hand to keep its shipyard running at full capacity until 1914. The New York Shipbuilding Company, of Camden, N. J., probably the largest concern of the kind in the country, is not bidding on anything calling for delivery in less than eighteen months.

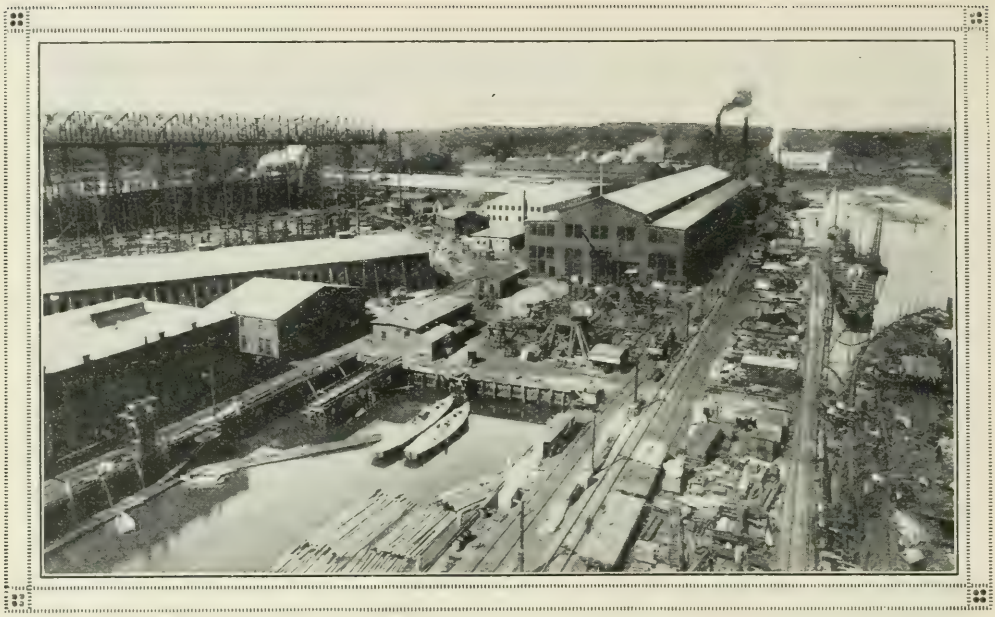


TURNING OUT MACHINERY FOR ONE OF THE NEW SHIPS THAT WILL FLY THE STARS AND STRIPES.

The Newport News Shipbuilding Company has twenty contracts on hand. The Detroit Shipbuilding Company of Detroit, Mich., is building five steamers for the Atlantic coast service. The Toledo, Ohio, Shipbuilding Company is building four freighters also for the Atlantic coast, and so on.

That the revival of the shipbuilding industry is of very recent origin is amply proved by statistics published by various Government departments. The Census Bureau has found that while the number of shipbuilding establishments in 1909 showed an increase of 23 per cent over 1904, they turned out 11 per cent less work than in the former year. In 1909 the output was 260,765 tons, or within eight thousand tons of the 1911 total.

The Bureau of Navigation reports that for the fiscal year ended June 30, 1912, 1,720 sail, steam and unrigged vessels aggregating 243,792 tons, were built in the United States and officially numbered. This is a marked decrease as compared with the last calendar year. But the very next day after the statistical record closed the New York Shipbuilding Company launched a tank steamer for the Standard Oil Company of 1,500,000 gallons capacity. Two days later the Newport News Shipbuilding Company launched the steamer Carolyn, of 5,100 tons deadweight capacity for the A. H.



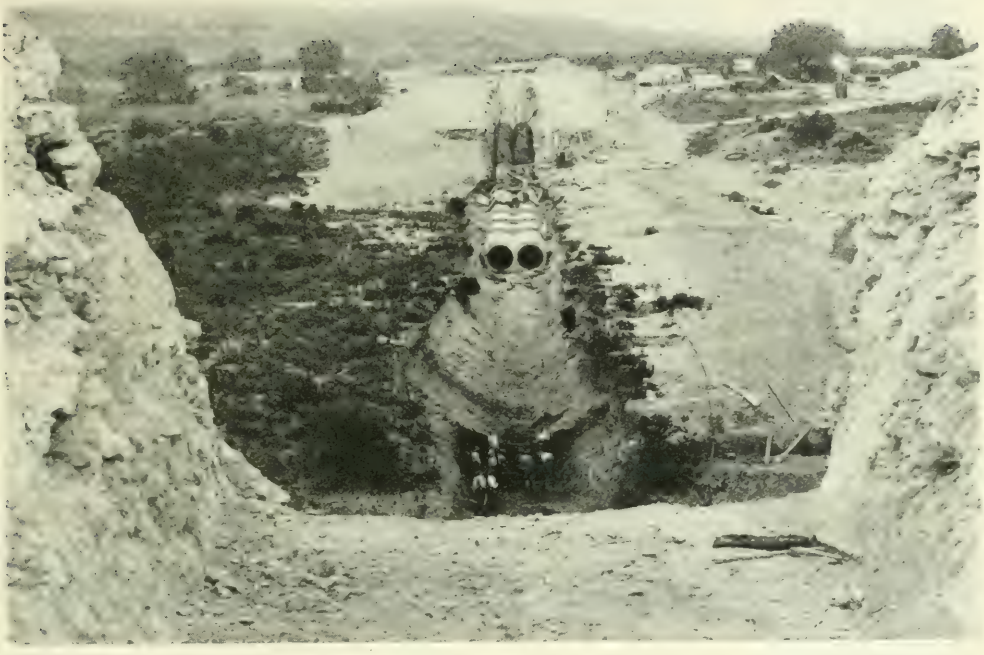
ANOTHER VIEW OF THE BUSY YARDS AT QUINCY.

Bull Company for the Porto Rico trade. There have been several other launchings since. The great volume of contracts let in the last few months, of course, will not appear in shipbuilding statistics until the vessels are completed.

The shipbuilding boom here is but a part of a similar activity that is world-wide. The increase in the ouput of German, Italian, French and British shipyards has already been noted. All the other nations are very busy turning out an increased tonnage. Even Russia has taken to building ships with desperate energy, her output showing an increase of five thousand per cent last year over 1910. As for British shipyards, in spite of their enormous capacity, they are so crowded with business that it is impossible to place an order there for delivery earlier than 1914.

In explanation it is said that the boom is the inevitable result of the dull times in the industry for some time past. Ships are lost in dull times as well as in good. American sailing vessels aggregating fifty thousand tons were lost at sea last year. This was equal to the total production of ships of this class for three years. Steamships, too, go to the bottom with distressing regularity, while those that remain afloat wear out or become obsolete. Altogether the steamship companies found themselves at last in the same predicament as the railroads; that is, they had refrained from buying new equipment until they reached the point where they simply had to begin buying or go out of business.

The buying impulse has been stimulated by the tardy discovery by both steamship and railroad managements, that no matter how much the lawmakers may play politics, nor how dyspeptic financiers may croak about ruinous legislation and confiscation of property, people will go right on eating at least enough to keep them alive, wearing at least an irreducible minimum of clothes, and buying whatever else they can get on the installment plan; that as population is steadily increasing traffic therefore must also increase; and that if they did not take care of this growing traffic some one else would do so. Under such circumstances there was nothing to do but to turn in a hurry call for more ships and more cars. The shipbuilding boom is but a single symptom of a rising tide of prosperity that can no longer be held back.



A SET OF SIPHONS, THIRTEEN HUNDRED FEET LONG, UNDER CONSTRUCTION NEAR SAN ANTONIO, TEXAS.

LENGTHY SETS OF SIPHONS

IN an irrigation system under construction near San Antonio, Texas, at a cost of $10,000,000, huge siphons are being laid under the bed of the Medina River for the purpose of conveying the water from one side of that stream to the other. The intake of the main canal is at the diversion dam. It follows the hillside, bordering the river for a distance of over a mile, where the water will be made to enter the first of two sets of siphons.

The first siphon set will consist of two reinforced concrete tubes, each eight feet in diameter. The double siphon tubes are laid about six feet below the bed of the river. The first set of tubes is 1,150 feet long, traversing a stretch of lowlands that is subject to periodical overflows. The second set is situated about a mile below where the first siphon crossing is made. The second set also consists of two tubes of reinforced concrete, each of which is seven feet in diameter and thirteen hundred feet in length.

QUAINT FARM GATE

PROBABLY one of the most unique gates in the world is that shown by the accompanying photograph which is made of farm implements. It took the designer several years to work out the details of the structure which is now one of the curiosities of Moulton Northlands, in England. It is indeed a strange piece of work which people travel many miles to inspect, and the handy man who made it prizes it as an expression of farm utility if not beauty. It is a quaint piece of work, containing in its structure some old and rare implements.

CURIOUS FARM GATE IN ENGLAND.

KING OF PHILIPPINE VOLCANOES

LUZON, the largest island of the Philippine group, is graced by a chain of volcanoes, extinct and active, from north to south. Many of these have subterranean connection, so that when one turns loose its fury it is just possible that a sister many miles away will do the same. These volcanoes have a commercial value to the islands, and if it were not for the havoc they now and then create, they might be looked upon as veritable blessings. It is the volcanic ash from these mountains that produces fertilizer for the finest hemp in the world, and the world's hemp supply comes solely from the Philippines.

MAYON VOLCANO, LUZON, THE MOST PERFECT VOLCANIC CONE IN THE WORLD.

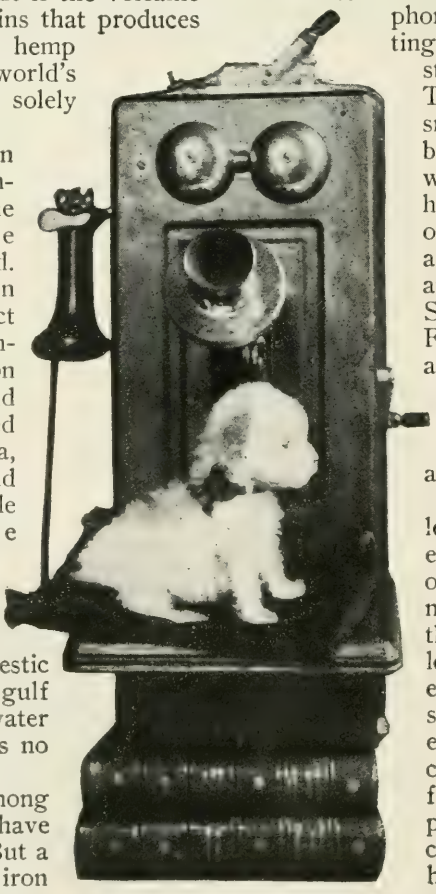
Mayon volcano, in Albay province, Southern Luzon, is one of the most beautiful active volcanoes in the world. Viewed from certain points it is a perfect cone, resembling an inverted letter V. Mayon is constantly active, and at its base lies the buried town of old Daraga, with nothing but the old church roof and steeple sticking above the ground today. The town of Legaspi, one of the largest hemp exporting ports in the world, also lies at majestic Mayon's base on the gulf of Albay, a body of water which legend says "has no bottom."

Many Americans, among them some noted men, have reached the summit. But a flag supported by an iron staff placed there by one party was soon destroyed by sulphur fumes shot up from the crater. The mountain rises to a height of over eight thousand feet and many interesting photos have been made by the Philippine bureau of sciences of the crater.

This volcano is one of the most interesting to be found anywhere in in the whole world, by all reports.

SMALLEST DOG OF ITS KIND

"MIDGET," probably is the smallest dog of its kind known. The telephone on which she is sitting is one of the standard styles, nine inches wide. The dog is really much smaller than she looks to be in the picture and weighs but five and one-half ounces. Her fur is over an inch in length, and she can be hidden in an ordinary pint cup. She belongs to the French poodle family, and not long ago became the mother of several puppies, which, of course, are midgets also.



SMALLEST DOG OF ITS KIND

The breeding of useless though sometimes entertaining family pets of this sort, is, of course, nothing new. We find the little Mexican hairless dog that often shivers even in the rays of the sun when they are moderately warm. Strange canine pets also come from China. One would probably have to go a considerable distance, however, before finding the equal of "Midget."

SWEETEST ROAD IN THE WORLD

IMMEDIATELY north of the main building of the Department of Agriculture at Washington, is a road which could at one time boast of being the sweetest highway in the world—a sort of candy road as it were, because its surface had been coated with molasses.

HIGHWAY THE SURFACE OF WHICH HAS BEEN COATED WITH MOLASSES.

We have all read in our story books of childhood about orchards bearing sugar plums and fences composed of sticks of candy,—fables to please the imaginative young mind,—but here in reality was a road that was actually sweet until the scientist, to keep away flies and bugs, mixed lime with the molasses.

According to one of these scientists one of the greatest problems in road-making of the present time is the production of a substance that will efficiently bind together the hard material of the wearing surface. Crude oil, coal tar products, pitch, cement, etc., are now being used for this purpose, and in order to test the efficiency of molasses as a binder, the mixture of molasses and lime was spread on this road—about a half mile in length. In many districts of the South low-grade molasses can be obtained very cheaply from the numerous sugar mills. The roads there are very poor and it was hoped that if this experiment proved successful the highways in that section could be improved materially. But alas, when the first strong rain fell on the "candy" road the gutters were filled with molasses running away into the sewers.

SAID TO BE THE LARGEST AND MOST PERFECT CRYSTAL IN THE WORLD.
Now in the Boston Museum of Fine Arts.

WONDER AMONG CRYSTALS

WHAT is said to be the largest and most perfect single crystal in the world is to be seen in the Boston Museum of Fine Arts. It was discovered in the mountain of Antake-Muko-Yuma, in Japan, in 1876. It is eighteen inches in circumference by fourteen and a half inches in width while it is twelve inches thick. As one approaches it, the crystal has the appearance of a beautiful, huge soap bubble, but as it weighs all of nineteen pounds there is a good deal more "heft" to it than there is to a soap bubble.

The crystal went through the laborious and painstaking process of cutting and polishing in Japan, and it had several owners before it was finally presented to the Museum. The next crystal in size is that in the Green Vault Museum, Dresden. The cost of the American crystal, while not revealed definitely at the Museum, is known to have run far up in the thousands.

Those prone to crystal-gazing, a fad that ever and anon comes to interest society, would take great delight in this wonderful stone. Only those, however, who really love beautiful things can appreciate this remarkable prize.

THE DEVICE AS IT APPEARS FROM THE REAR.

NEW WAY TO STOP FRIGHTENED HORSES

By

NORMAN MAUL

SEVERAL years ago, a team of horses crossing the Brooklyn Bridge, over the East River in New York, became frightened at the toot of a ferry boat whistle, and jerking their driver from his seat, ran away. Their progress unchecked, they dashed madly into Park Row, where there is always a congestion of traffic. A woman and her baby were the victims.

That accident awakened the authorities to their responsibilities and heavy timber gates were installed on the bridge roadway. These gates were so constructed that they could be swung across the road at the approach of a horse, presenting an immovable barrier into which he crashed. The gates served their purpose, but many horses were killed, wagons were destroyed, and drivers were often removed in the ambulance.

While these conditions prevail on the old span there is quite a different situation on the Williamsburg Bridge, which was opened just a few years ago. This bridge connects the East Side of Manhattan with the Williamsburg section of Brooklyn, and is one of the busiest arteries of interborough travel. From early morning until late at night there is an unbroken stream of vehicles on the bridge. There are lumbering milk wagons, fast automobiles, funeral processions, moving vans, motor trucks and produce wagons, all traveling along a twenty-foot roadway, more than a mile and a half in length.

It is on this wide roadway, with its three per cent down grade that many a skittish horse has started on the career that ended in his own destruction. With a clear field to run in, and with many factors to frighten him, it is no wonder that a runaway a week is the average for the Williamsburg Bridge. On the records of the bridge police it is shown that during the four years prior to February, 1910, there were 185 runaways, involving 246 horses. One hundred and twenty-

THE CATCHING DEVICE FOR RUNAWAY HORSES AS SEEN FROM THE FRONT.

seven of these were stopped by heavy wooden gates similar to those on the old bridge. The casualty report shows that 53 horses were killed, 47 were injured and 96 drivers required medical attention

This continued until two and a half years ago, when the ingenuity of a bridge department laborer and an electrical contractor evolved an electrical runaway gate that stopped horses without even touching them. Not a horse has been killed on this bridge since this gate was placed in operation, not a truck has been smashed, and always the driver, after recovering from his fright has been able to drive his horse himself.

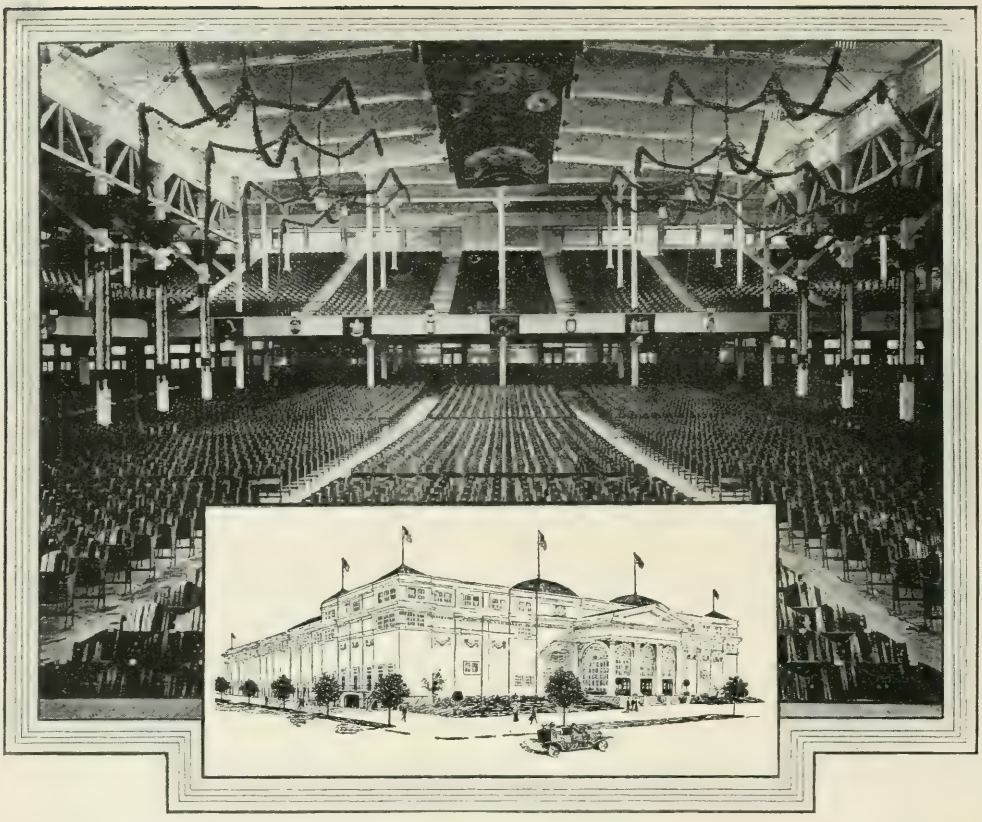
The new gate instead of forming a rigid barrier across the road, has its two leaves swing together and form a deep chute which lies along the road. At its mouth, the chute is the width of the roadway; at its apex, is an opening a foot wide; it is forty-eight feet long; its steel-sheathed timber sides are higher than a man's head, and the whole mechanism is controlled by the simple turn of an electrical controller.

At the sound of an electric bell, the bridge patrolman leaps to his place at the controller, ready to close the gates.

Here he may perhaps have to exercise his coolest judgment, for right in the path of the runaway may be another wagon which must not be trapped. A shout adds speed to the progress of this rig, and just as it dashes past the current is turned into the motors and slowly the big gates come together. It takes six seconds to bring them into position, and as they cease their motion, the runaway horses at a speed not lessened a mite, dash into the chute—and stop. Stopped is their progress, but with what a frantic pawing and scrambling to get away from that irresistible grip that holds them in check! Apparently free to go their way, they are unable to proceed.

When they become quiet from exhaustion the policeman opens the chute, the team is driven through, and traffic over the bridge is resumed.

This is how it is done: The gates form a forty-eight foot chute, with a foot-wide opening at the far end. When a horse finds himself blocked on all sides he makes for the opening. Then he is suddenly stopped. He does not scrape his shoulders, or even come in contact with the sides of the chute. The wagon does all that. On the steel sheathing there are long scratches. That is where the hubs of more than one hundred runaways have struck. As the chute narrows, the grip on the hubs tightens and in a distance of from one to eight feet, according to the angle at which the team enters the chute, the whole outfit is at a standstill. There are six push buttons at regular intervals along the bridge span, and as soon as a horse breaks, the nearest policeman runs to his booth and sends the signal. The rest is easy. A turn of the controller and the policeman who has first chance to heed the warning sends the electricity into the motors, which in turn operate a worm gear arrangement, and as they push a steel arm outward, bring the gates together.



PHILADELPHIA'S NEW CONVENTION HALL WHICH WAS PUT UP IN A HURRY.
It will seat twenty thousand.

ARCHITECT BREAKS BUILDING RECORD

By

A. ST. GEORGE JOYCE

"YOU have just 104 working days in which to build a new convention hall for the city of Philadelphia. If you finish it in time you will be handed a check for $106,000. If you do not, you will be heavily fined for violation of the specifications. The hall must be ready to house the national Saengerfest which meets June 29. If you accept these conditions, go ahead with the work."

Mayor Blankenburg, of Philadelphia, made this declaration to Mark P. Wells, a Philadelphia builder, on February 15. The enormity of the job was apparent; the building was designed to house twenty thousand persons, with a stage having a seating capacity of six thousand singers. And only 104 days to build it, the largest wooden structure of its kind in the world!

Wells said he would tackle the job on the basis of the Mayor's declarations, and he not only finished the work in the specified time, but actually had the build-

ing completed and turned over to the city authorities in sixty-nine working days. And of the sixty-nine working days, twenty-four of them were rainy. Construction of the building in such a short time is considered one of the wonders of building in this country in recent years.

The very day ground was broken for the structure it rained. And it continued to rain for a week afterward. Contractors generally thought it an impossibility to finish the job in the specified time, not only because of the bad weather conditions, but because of the scarcity of the lumber needed, some of the planks averaging fifty-six feet in length and fourteen by fourteen inches in thickness. But an army of workmen kept on the job day and night and the hall is now open.

Despite the rapidity with which the work was done, not a foot of the lumber was condemned by the bureau of building inspection. The bureau considers the hall one of the most model structures of its kind in the world. The lumber was sawed into shape and bolted on the grounds, the workmen using two electric saw mills, electric and steam drills, three steam engines and a regular forest of derricks.

The convention hall measures 200 by 400 feet.

During one day there was no less than 10,000 feet of roofing done. Concrete piers had to be sunk for the 365-foot wall and roof supports.

Ground was broken for the hall on February 26. The work of construction began March 6. It seemed as though everyone wanted to help the work along. Unions suspended rules in order that workmen might work overtime and at night. Under a dynamic-directing force the great structure grew as if by magic.

The first column was raised on Easter Monday and on May twenty the building was entirely under roof. During this period the workmen were hampered by twelve rainy days. It is as solid as a steel structure, according to the building inspectors. On June 16, after forty-nine working days, the building was formally turned over to the city, thus establishing a record which has rarely ever been equalled anywhere else in the country.

It is as impossible for a human being to be happy who is habitually idle as it is for a fine chronometer to be normal when not running. The highest happiness is the feeling of well-being which comes to one who is actively employed doing what he was made to do, carrying out the great life-purpose patterned in his individual bent. The practical fulfilling of the life-purpose is to man what the actual running and keeping time are to the watch. Without action both are meaningless.

—Orison Marden.

PIGMY HIPPOS

A PAIR of pigmy hippopotami, considered the rarest animals in existence and practically entirely new to the eyes of the civilized world, were recently received at the New York Zoological Park. They cost $12,000, and were caught in the jungles of Liberia, Africa. These midgets are three and a half years old, the male is twenty-four inches high, and the female eighteen inches; the weight of each is about two hundred pounds. Here are some of the details in regard to the capture of the tiny hippos. Eighteen months ago, Mr. Carl Hagenbeck, ever ready to try the untried, and attempt the impossible, dispatched to Liberia an intrepid hunter and explorer named Hans Schomburgh. His mission was to find and secure alive several specimens of the almost mythical pigmy hippo. The region which finally had to be penetrated was found to be reeking with cannibals. It took a half hundred armed native soldiers to protect the daring hunter from being eaten up while he was searching for and capturing the live specimens. They were shipped first to Hamburg and from there they came by steamer to New York.

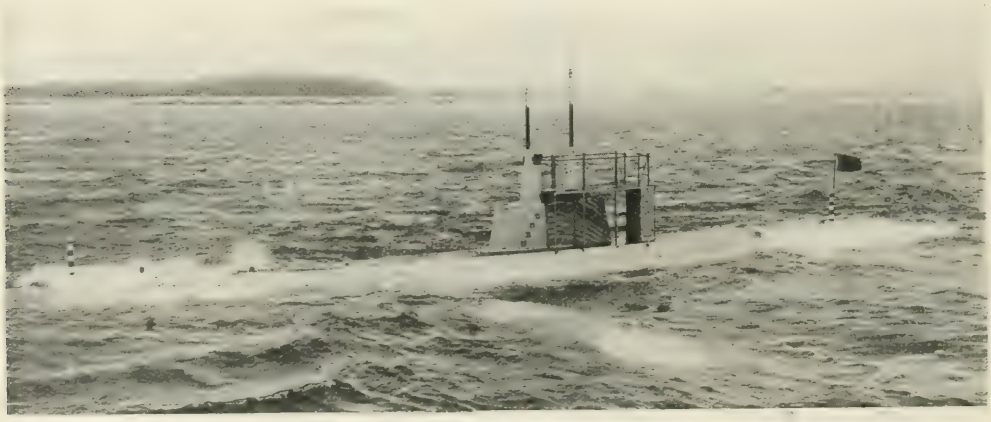
PIGMY HIPPOS FROM THE INTERIOR OF AFRICA.

GREATEST OF HAIR-WORKERS

L. P. FEDERMEYER, the proprietor of a hair-dressing establishment in Chicago, is also an artist and a genius in his profession.

On the walls of his store may be seen hanging mottoes and designs and higher up, large bust portraits of world-famed men. You glance at them casually, as you would look at any picture on entering a home, but, when you are told that these pictures were made up entirely of human hair, without a single line of paint, pencil, or crayon, you are rather astonished. At first you are half-inclined to doubt the veracity of the proprietor, but when he produces a powerful magnifying glass, and you see hair—nothing but human hair—some of it chopped up almost to powder, your doubts are satisfied.

The first picture is an oval bust of Kitty Putnam, an actress. Then comes one of President James Garfield; busts of



U. S. NAVY SUBMARINE, *F. 1.* WHICH HAS BROKEN ALL WORLD RECORDS FOR DIVING.
F. 1. plunged to a depth of 283 feet below the waves in San Francisco Bay. The previous record of a submarine was 256 feet. Lieut. J. B. Howell, and 26 men were on board.

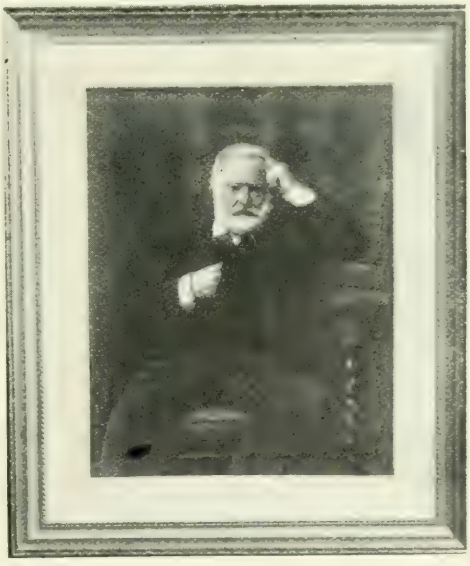
THIRTEEN THOUSAND IN THE AMBULANCE SERVICE SEE KING GEORGE OF ENGLAND.
The photo shows that part of the grand review consisting of the nurses.

Victor Hugo, the French novelist; and of Gambetta, the French statesman; a picture of Napoleon I, known as "The ghost of Napoleon visiting his grave;" and still another picture of Garfield, surrounded by his cabinet. The remarkable thing about this latter picture is that each of the seven portraits comprising the cabinet is made up of a single hair, each hair being thirty inches long.

A landscape, six feet long and four feet wide, made entirely of human hair by Mr. Federmeyer, was sent to the Paris Exposition of 1878. For this picture Mr. Federmeyer received a silver medal, and was offered $700, which he refused, preferring rather to make it a present to his family in France.

Mr. Federmeyer came to America in 1876. He started in the hair-dressing business in New York, and it was here he became acquainted with the world's greatest hair-worker, a Frenchman by the name of Moutoux.

Moutoux produced pictures at that time, made of human hair, but the shading was brought out with paint.



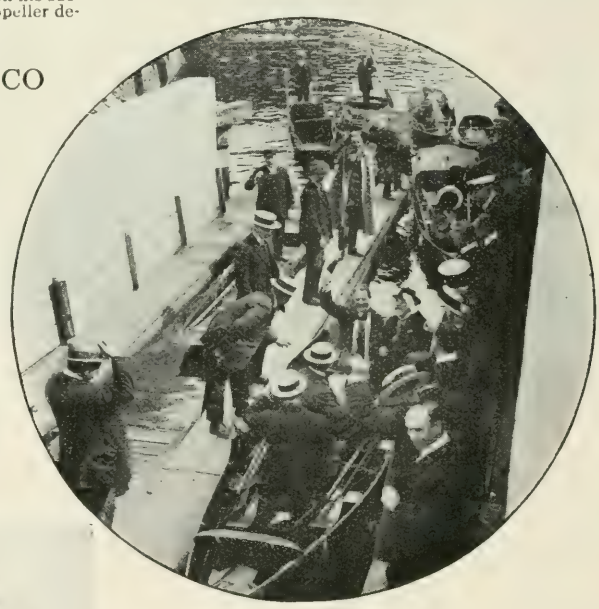
PORTRAIT OF VICTOR HUGO. DONE IN HAIR.

THE FRENCHMAN DE LESSEPS' CURIOUS NEW AUTOMOBILE.

The photo shows the inventor about to start on his successful trip from Paris to Lyons. Note the propeller device at the rear of the car.

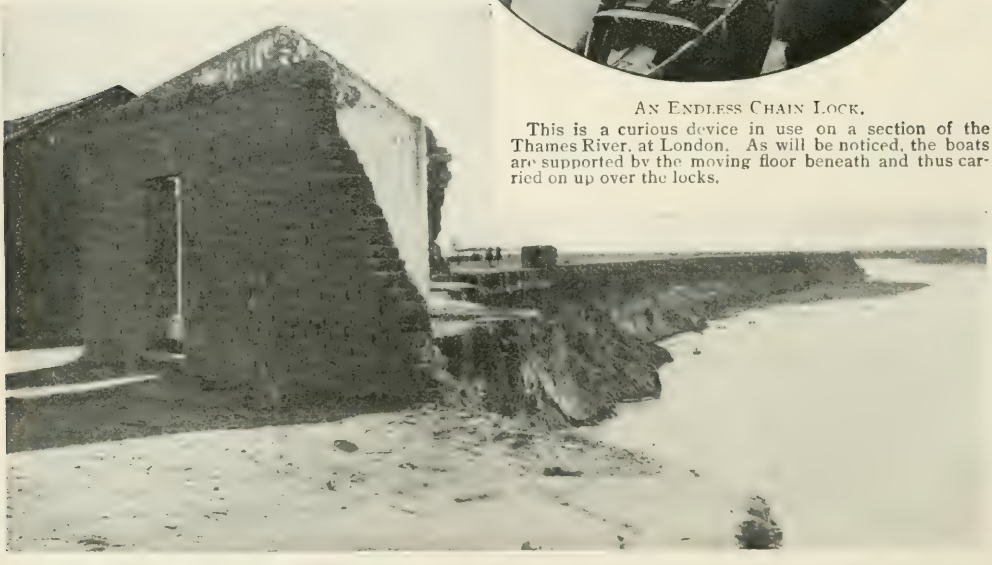
MEXICALA OR CALEXICO

THERE is a difference of opinion as to the name of the town, a fraction of which is here illustrated. The town is situated on the boundary line between Mexico and California. The line cuts it in two. On the Mexican side it is called Mexicala, a name derived from a combination of the names of the two communities in each of which it partly exists. On the American side the town is known as Calexico, a name similarly derived but in which the community on this side of the line is given precedence. The two names are official on the different sides of the line and are so recorded in governmental maps. Aside from being bisected by a national boundary and torn asunder by a race feeling that makes uniformity of name impossible, Mexicala or Calexico has recently been physically cut in two. The great Colorado River runs some miles to the east of the town. It rides on to the sea on a high dike that it has made for itself by the deposits that it has brought down from the mountains. To the west is Salton Lake, several hun-



AN ENDLESS CHAIN LOCK.

This is a curious device in use on a section of the Thames River, at London. As will be noticed, the boats are supported by the moving floor beneath and thus carried on up over the locks.



MEXICALA OR CALEXICO?—WHICH IS THE NAME OF THIS TOWN?

PUMPING OUT A FLOODED CELLAR WITH AN AUTOMOBILE.

dred feet below sea level and more below the level of the water in the river. Half a decade ago the Colorado got tired riding in its trough and broke through and struck out for the Salton Lake. In its track stood the controversial town. It cut the town in twain and crumbled a good portion of it into the ditch and hurried in on to the salty lake in the desert. The cut was mended through the ingenuity of man and the expenditure of a lot of money and the cut is now dry. But Calexico-Mexicala has a new line of cleavage along which to split.

AUTO PUMPS OUT FLOODED CELLAR

THE automobile in the picture is of 30 horse power and is owned by a consulting engineer in Denver, Colorado. The rear end of the machine may be seen raised from the ground and by means of a belt, connected with one of the rear wheels, the engine is made to drive a centrifugal pump to its full capacity. This was one of the many methods used to drain the cellars, hundreds of which were filled to overflowing by a cloudburst in Denver. The dark line on the building shows the height that the water reached during the flood.

RAINY DAY ROAD RECORDS

TO make a perfect log of a long automobile tour is a task that requires both patience and constant watchfulness, but if there is added to the natural inconveniences of such a task a constant down-pour of rain it becomes almost impossible to preserve a legible record.

For the recent Indiana Four-State Tour, covering a distance of more than 1,200 miles, Mr. W. D. Edenburn, the official pathfinder, devised the writing case shown in the illustration.

The apparatus consists of a steel writing file with a spring clip for holding the paper. Over the top is formed a semi-cylindrical covering of transparent celluloid which keeps out the rain, and at the same time enables the writer to see his manuscript. At the end where the hand is inserted is a waterproof storm curtain which prevents the water from entering while the device is being used.

Such a device seems to possess a commercial value as well, for writing letters or telegrams enroute and for delivery men driving trucks about the city in bad weather. Receipts for packages and bills could be safely carried by the driver in such a case.

FOR MAKING RECORDS OUTDOORS IN RAINY WEATHER.

BLAZING THE WAY TO THE GULF

By

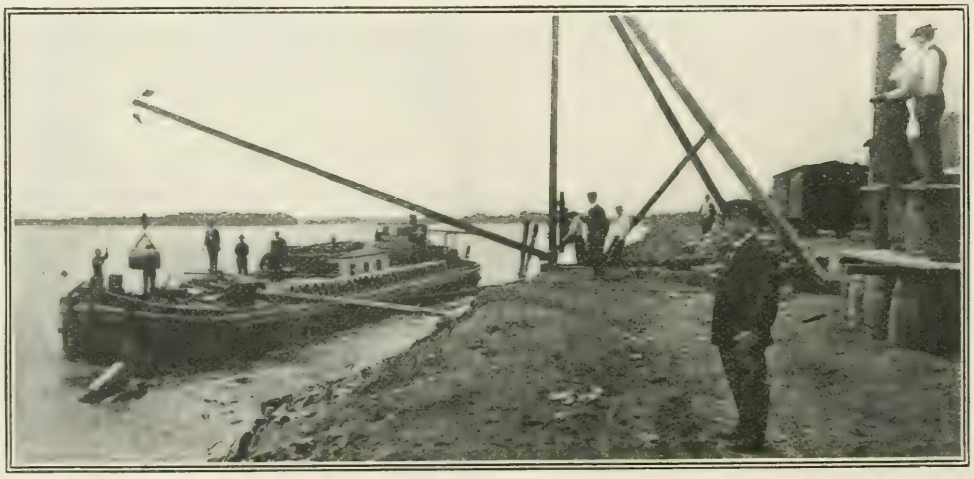
RAY FRAZER

A BULGED-BOWED, battered and unpretentious-looking canal steamer, but with a resplendent name, the *Peerless*, has within the past couple of months risen from the humble position of canal barge to that of a trail blazer. This squatty little barge has demonstrated conclusively that the great Lakes-to-the-Gulf waterway is not a dream to be realized some time in the future, but is a present day reality. Because of what this boat did the army of Illinois manufacturers have ceased to sing "We'll wait for fourteen feet through the valley." Instead they are saying to each other, "Ship your freight by water now; its cheaper." She has proved that the "tad-pole ditch," as the Illinois and Michigan Canal is sneeringly called, is, after all, not such a weak link in the chain of waterways between the lakes and the gulf but that it may be used to commercial advantage. Bulk freight —like the one hundred tons of salt which the *Peerless* carried from the docks in Chicago to Muscatine, Iowa,—can be transported by water to trans-Mississippi points for about one-fifth what it costs to reach the same points by freight car.

This was the first commercial use of the waterways on which the State, the Federal government and the Sanitary District of Chicago have expended over $70,000,000.

Since its first trip in June the *Peerless* has been puffing back and forth between the salt company docks in Chicago and the distributing station at Muscatine, proving over and over again that although a "deep waterway" may be better, a deep-enough waterway is at hand. The *Peerless* tows two barges on each trip now and these triple the amount of tonnage without adding much to the operating cost. The operating cost of the first cruise was two mills per ton mile while the railroad rate is five mills per ton mile and up.

Those Chicagoans who have not yet put in their orders for a shallow draft freighter had better make their plans to

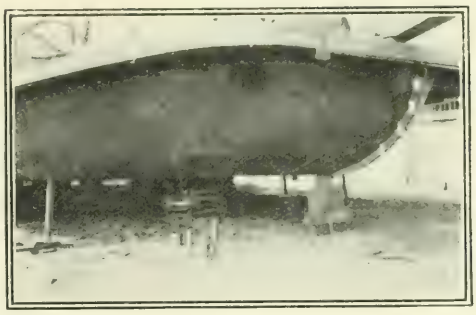


THE FIRST SHIPMENT OF FREIGHT—A LOAD OF SALT—FROM CHICAGO TO MUSCATINE, IOWA. VIA THE ILLINOIS AND MICHIGAN CANAL, ILLINOIS RIVER AND HENNEPIN CANAL.

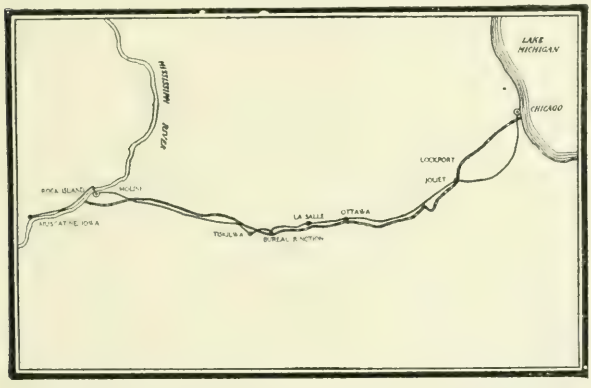
use it some time a year from now. Every boat builder in Chicago is being kept busy with orders. Three steel barges with tunnel sterns and heavy duty gasoline engines are being built for the salt company that first made the experiment with the *Peerless*, in addition to numerous canal barges which have been bought or leased from the Erie Canal and from anywhere else they could be secured. Other manufacturers in Illinois are placing orders for these flatbottomed dewskimmers. Designers for one Chicago firm, who have heretofore built the shoal draft ships for every country but America are now devoting their attention to producing boats suitable for the new route to the South.

The *Peerless* is not a shallow draft boat when compared with the tunnel stern rift-climbers. It draws four feet nine inches and scraped the sand bars considerably on its first trip. But the Illinois manufacturers, now that they see a new era in transportation, are taking care of the future needs of the *Peerless* and her trailers. Legislators and State officials are being pledged to dredge the "tad-pole ditch" to its original depth of eight feet. There is at least six feet of water through the other links of the route. The drainage canal has a depth of twenty-two feet.

To make it possible to increase the cargo of a barge from one hundred and fifty tons—the capacity of the *Peerless*—to one thousand tons, the manufacturers have started a campaign to get a small appropriation from the next session of the legislature.



Type of Boat of Shallow Draft for Canal Use Recommended by U. S. Government Engineers.



How Freight Boat Traffic May Reach the Mississippi River From Chicago.

"If the locks on the Illinois and Michigan Canal are enlarged to a width of thirty-five feet, from their present seventeen, thus making them the same size as the Hennepin locks," suggests the owner of the *Peerless*, "then barges measuring thirty by one hundred feet can be used and the operating cost reduced considerably."

A Chicago builder of vessels says that 1,000-ton barges could readily be used with such a width of the locks and necessary repairs to the banks of the old canal. This same builder is also authority for the reply to those who think water-borne freight too slow for this day and age. He points to statistics to show that a barge moves at the rate of one hundred miles in a 24-hour day, which is just the speed of a slow freight train.

Old Canal Boat Pressed into Service Again.

PARACHUTING DOWN AN ELEVATOR SHAFT

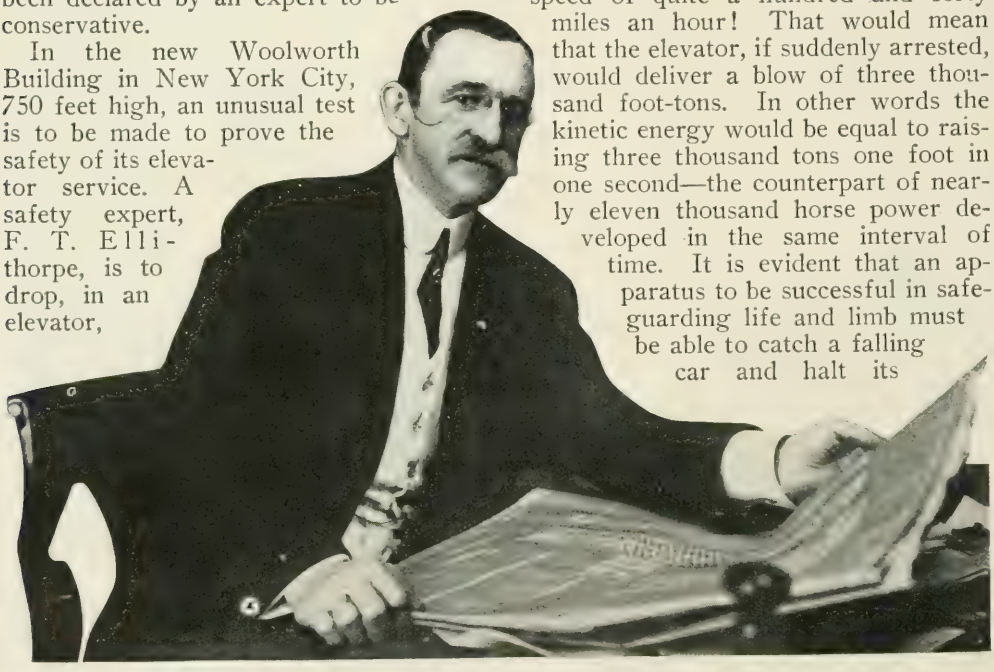
By

RICHARD SNOWDON

NEW YORK CITY leads in skyscrapers and in elevator accidents. New York has more than twice as many as Chicago, and pretty nearly as many as Chicago, Philadelphia and St. Louis combined. This may or may not signify the peril of the skyscraper, but it certainly points to the need of better protection for the public traveling in elevators. As a matter of fact, there are more than a thousand persons killed and injured by falling cars every year. This many are actually recorded by casualty companies, and there are probably a good many other mishaps of this sort which escape official notice. These figures have been declared by an expert to be conservative.

In the new Woolworth Building in New York City, 750 feet high, an unusual test is to be made to prove the safety of its elevator service. A safety expert, F. T. Ellithorpe, is to drop, in an elevator, seven hundred feet. This gentleman may quite properly be described as a soldier of public safety. You might reasonably expect him to be a bit nervous over the ordeal, but he is probably the calmest man interested in the outcome. Parachuting seven hundred feet in a plunging elevator is not normally a pleasurable thing to look forward to. Most of us would look upon it as sure death. Just the same, the drop will be made in order to establish beyond peradventure the security of life should any of the cars drop afterwards in service.

Each loaded car will weigh about twelve thousand pounds, and dropping seven hundred feet it would acquire a speed of quite a hundred and forty miles an hour! That would mean that the elevator, if suddenly arrested, would deliver a blow of three thousand foot-tons. In other words the kinetic energy would be equal to raising three thousand tons one foot in one second—the counterpart of nearly eleven thousand horse power developed in the same interval of time. It is evident that an apparatus to be successful in safeguarding life and limb must be able to catch a falling car and halt its



MR. F. T. ELLITHORPE. INVENTOR OF THE AIR CUSHION SAFETY DEVICE FOR ELEVATORS.

downward course without doing this suddenly and violently. It is highly probable that many of the people injured each year by elevator accidents are hurt through being hurled to the floor of the car when stopped too abruptly by the safety mechanisms provided. Unfortunately, others are killed or injured because of the absence or the utter failure to work of safety appliances. Mr. Ellithorpe's spectacular drop is to show the manner in which the atmosphere can be utilized in checking, without shock, a plunging car.

Everyone knows how the spreading surface of a parachute will save the venturesome acrobat from being dashed to earth when jumping from a balloon high in the air; that his downward plunge is arrested in this manner before his fall has acquired too much velocity. When the parachute is tardy in unfolding the jumper's speed becomes so great that the fabric is torn to ribbons—if it spreads—by the force of the opposing air. In other words, the parachutist's safety hinges upon the timely spreading of the parachute. The air cushions which are designed by Mr. Ellithorpe to make his drop a harmless one are intended to work under conditions which substantially reverse the protective function of the parachute. But Mr. Ellithorpe is going to call into use this air to check the downward course only toward the end and not at the beginning of the elevator's fall. This would seem to add to the peril because it gives the plunging car just so much more time in which to acquire dangerous momentum.

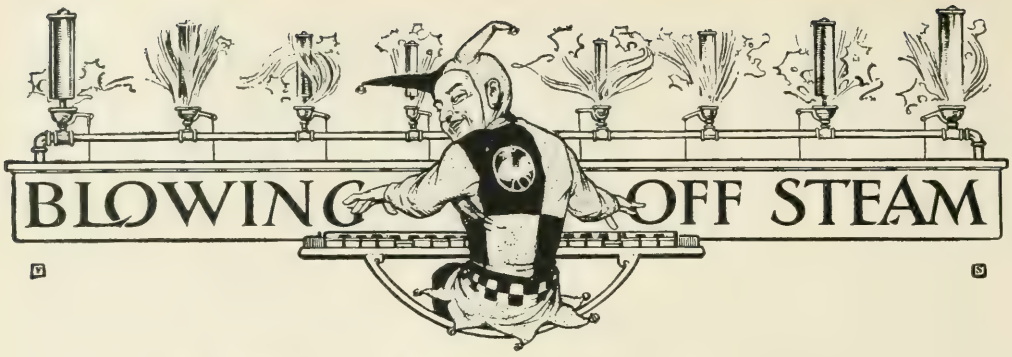
Montaigne's Thoughts

¶ Men are most apt to believe what they least understand.

¶ A little folly is desirable in him that will not be guilty of stupidity.

¶ Man is certainly stark mad; he cannot make a worm, and yet he will be making gods by dozens

¶ The only good histories are those that have been written by the persons themselves who commanded in the affairs whereof they write.



Presence of Mind

AUTOMOBILIST (as he drives into the window of a milliner's shop)— "My wife wishes to buy that hat, there in the corner!"—*Meggendorfer Blaetter.*

Purely an Accident

WAITER—"Well, sir, how did you find the beef?"

DINER—"Oh! I happened to shift a potato, and—well, there it was."—*Bystander.*

Mistakes Will Happen

RICHARD HARDING DAVIS, during his Atlantic City honeymoon, said at a fish luncheon: "I confess that I am not pleased with the modern trend of fiction. The newest fiction leaves a bad taste in the mouth. It is full of double-entendre—like the parlor maid's remark. A gentleman came down to breakfast one morning with bloodshot eyes. He drank eight glasses of water hurriedly, then he muttered hoarsely to the pretty parlor maid: 'Tell me, Adele, did I reach home last night very much under the weather?' 'Indeed you did, sir,' the maid replied. 'Why, sir, you kissed the missis!' "—*San Francisco Argonaut.*

Incurable

PROUD MOTHER—"Such enormous sums as we've spent on Clara's voice."

SYMPATHETIC VISITOR—"And you can really do nothing for it?"—*London Bystander.*

Forthwith

AUTHOR—"The very first thing I sent to a magazine was accepted."

YOUNG FRIEND—"Was it poetry or prose?"

AUTHOR—"Prose. It was a check for a year's subscription."—*Boston Transcript.*

She Had Her Choice

"WHY should I marry you?" she asked superciliously.

"Well, of course," he replied, "you can die an old maid if you want to."—*Lippincott's Magazine.*

Another Reformer

"YES, I've cut out the slang stuff," Nell was telling her latest "gentleman friend." "Gee, but my talk was gettin' fierce! I'd worked up a line o' fable-material that had George Ade backed off the map and gaspin' for wind, but I've ditched all that now. I seen it was up to me to switch onto another track. Jammed on my emergency brakes one day and says to myself, 'You mutt, where you think you'll wind up if you don't slough this rough guff you're shovin' across on your unprotected friends? You never will land a Johnny-boy that's enough gray matter in his cupola to want a real, bang-up flossy lady for his kiddo instead of a skirt that palavers like a brain-storm with a busted steerin'-gear.' Any girl can talk like a lady, even if she never gets closer to one than to stretch her neck when some swell dame buzzes past in her gas-wagon. I says to yours truly, 'It's time to reformate your grammar, little sister,' and you betcher sweet life I've cut the mustard."—*Satire.*

Oh, Yes!

"You are in love with a blonde," remarked the fortune teller, "but after you marry her, beware of a brunette who——" "No danger," remarked the patron; "it's the same woman."—*The Ladies' World.*

Naturally Literary

"COLONEL BROWN seems to be very literary," remarked a visitor to the Brown household to the negro maid, glancing at a pile of magazines lying on the floor. "Yas, ma'am," replied the ebony-faced girl, "yas, ma'am, he sholey am literary. He jes' nat'ally littahs things all ovah dis year house."—*Woman's Home Companion.*

It Happened in Milwaukee

OPERATOR—"Number, please."

SUBSCRIBER—"I vas talking mit my husband und now I don't hear him any more. You must of pushed him off de vire."—*Milwaukee News.*

Two Shut Up

RESTAURANT PATRON (caustically)—"I am glad to see your baby has shut up, madam."

MOTHER—"Yes, sir. You are the only thing that's pleased him since he saw the animals eat at the Zoo."—*Puck.*

As Far as He Went

THE boys had made good use of the steep hill in their search for winter sport, and their sleds and bobs had worn a track down the hill, where the snow had turned to ice.

A gentleman, whom we will call Mr. Chesterfield (he was really very polite), collided with a fat woman just at the brow of the hill, lost his footing, and fell; the woman fell also, landing on top of the polite gentleman. And down the hill they went, Mr. Chesterfield forming a toboggan on which the fat lady rode in safety. Faster, faster they went down the icy incline, not stopping until the foot of the hill was reached. Then the fat lady heard a very weak voice saying, "Pardon me, madam; you will have to get off now—this is as far as I go."—*Everybody's.*

The Dear Departed

CUSTOMER (missing his favorite waiter)—"Where's Charles today?"

WAITER—"I'm sorry, sir; but 'e's gone."

CUSTOMER—"Gone! Do you mean he's defunct?"

WAITER—"Yes, sir; an' with everything 'e could lay 'is 'ands on."—*The Sketch.*

Our Needs

"STEDFAST men are needed in public life," says Supreme Court Justice Pitney, "men able to resist the tumult of the crowd." And we also need a stedfast crowd—a crowd able to resist the encroachment of stedfast men. —*Life.*

Correct

"FATHER," said the small boy, "what is a demagogue?"

"A demagogue, my son, is a man who can rock the boat himself and persuade everybody that there's a terrible storm at sea."—*Washington Star.*

Getting Started

RECOVERED PATIENT—"Please tell me just what was done at the hospital, doctor."

FAMOUS SURGEON—"Well, we anæsthetized you, removed your tonsils, adenoids, and appendix, attached two floating kidneys, and then——"

RECOVERED PATIENT—"Good heavens! Then! Then what?"

FAMOUS SURGEON—"Then we started to operate."—*Life.*

Good Advice

BENHAM—"He called me a driveling idiot."

MRS. BENHAM—"Well, don't drivel."—*New York Globe.*

LAST STAND OF THE HORSE

IT looks as though the automobile is about to rout the horse out of one more of his strongholds. The present rules of the Department of the Interior prohibit the use of automobiles and motor bicycles in the Yellowstone National Park, so that here, at least the horse has felt safe from the encroachments of his modern enemy. But the new sundry civil appropriation bill provides for an expenditure of many thousands for widening and surfacing the roads leading from the boundaries of the park to the scenic belt-line road which takes in most of the wonders of the reservation, so that they will "be suitable and safe for animal-drawn and motor-propelled vehicles."

The traffic through the park is at present handled by horse-drawn stage coaches, requiring hundreds of horses. These horses are on the job for only three months each summer. During the remainder of the year they run loose on immense ranges in Montana. The pictures show the herd of the Yellowstone Park Transportation Company coming in from the range early in June for their summer's work; also one of the six-horse tally-ho coaches that meet the tourists, or "dudes" as they are called in park lore, at Gardiner and bring them to the first stopping place on the park tour, the Mammoth Hot Springs Hotel.

The inevitable change in the method of transporting tourists through the Park doubtless will take away some of the romantic atmosphere that the coaches supplied.

SOON TO BE A THING OF THE PAST.
One of the Yellowstone Park's tally-ho coaches loaded with tourists.

NEW STYLE HELMET FOR FIREMEN.
The top of the helmet, which is surmounted by a hollow ring, with openings, is connected to a hose. Thus a spray of water plays from the fireman's headpiece, giving him protection against the heat and flames.

THE HORSES THAT ARE TO BE SUPERSEDED BY AUTOS.

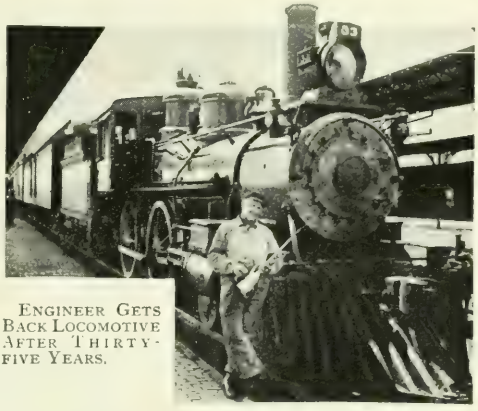
STANDING ON ITS HEAD.

This peculiar aeroplane accident occured at Norwalk, Ohio. When the machine was but a few feet from the ground, a gust of wind struck it in such a way that it was tipped forward upon its propeller, but the motor did not stop running. No part of the machine was broken by this singular accident.

SPATTER CONE OF A VOLCANO

THE spatter cone is a phenomenon of volcanic action that comes toward the end of the career of a given volcano, immediately preceding the cinder cone-building action which is the last thing a volcano does before it dies. The spatter cone is built of pieces of mud that are thrown out by escaping gas and piled about the opening through which this gas finds its way to the surface. In escaping, the gas must force its way through mud chambers that it keeps well mixed through its kneading process. A bubble of gas often gets beneath a piece of mud and as it escapes flicks this mud high into the air. The mud, descending, is likely to build itself a cone of strange and fantastic appearance about the mouth of the vent through which it has been thrown. There are mud volcanoes in Yellowstone Park that perform interesting feats in cone-building but none of these seem to have acquired the knack which results most successfully as have the expiring volcanoes of the Hawaiian Islands.

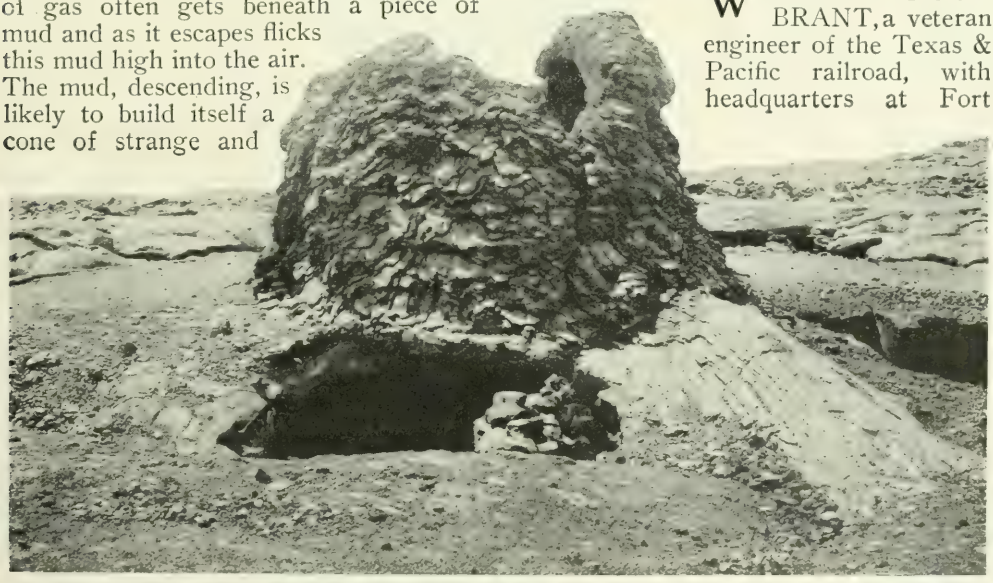
These volcanoes of the South Pacific, like most of those in the tropics, have peculiar and fascinating characteristics not to be found in the dying volcanoes of cooler zones.



ENGINEER GETS BACK LOCOMOTIVE AFTER THIRTY-FIVE YEARS.

VETERAN ENGINEER GETS BACK OLD ENGINE

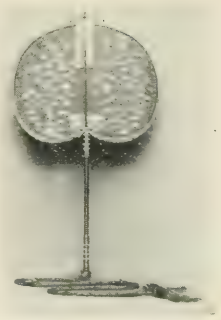
WILLIAM GARABRANT, a veteran engineer of the Texas & Pacific railroad, with headquarters at Fort



SPATTER CONE OF A VOLCANO.

Worth, Texas, received a surprise a short time ago when his first engine, one he used thirty-five years ago, was again placed in his charge. When Garabrant first ran this engine into Fort Worth, the town was on the frontier and few of the cowboys and Indians about the place had ever seen a train or locomotive. The cowboys proceeded to celebrate the occasion by shooting up the locomotive and today Engineer Garabrant recognizes a number of dents made by bullets in the smokestack and around the headlight. When Garabrant took charge of the "new" engine he patted it affectionately and told of the stirring times of frontier days and the hardships early day trainmen were compelled to undergo. He is known as one of the most reliable engineers on the Texas & Pacific system, and has never been in a serious accident. In his forty years of service he has been off but three weeks. His son also is an engineer.

The frontier engine restored to its former master has received a new coat of paint occasionally and has been often repaired, but Garabrant declares the shops could not tack enough old iron on the "old lady" to make recognition impossible for him. On its first runs the engine burned wood and averaged from but fifteen to twenty miles an hour.

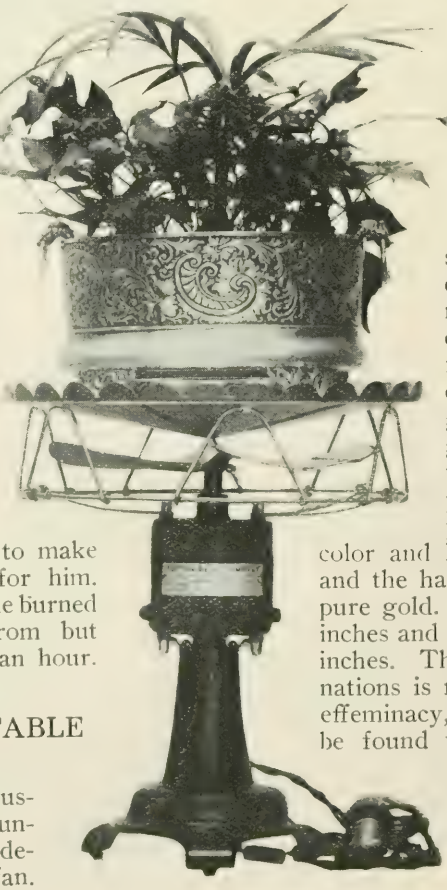


KOREAN WAR FAN HUNDREDS OF YEARS OLD.

NEW ELECTRIC TABLE FAN

IN the accompanying illustration is seen an unusual novel and artistic design of an electric table fan. It is so constructed that all parts of the table and room receive an equal distribution of air at the same time and continuously, the deflector causing a direct breeze on all sides. This result, it is said, is impossible to achieve with any other form of electric fan.

The deflecting plate forms a convenient stand for a fern or flower dish and the entire equipment is an ornament to the table, being beautifully finished in polished nickel and dull satin jet, a silk-covered cord conducting the current from the plug of an ordinary lamp socket to the universal electric motor.



ELECTRIC TABLE FAN.

GUMBAI SEN OR WAR FAN

THE original of this gumbai sen, or war fan, was brought from Korea about three hundred years ago and was owned by the Japanese hero Toyotomi Hideyoshi. The "gumbai sen" was used by generals when giving military orders in ancient times. The war fan herewith shown is embroidered with gold threads on a ground of silk, and there are 515 natural pearls and 290 culture pearls of splendid color and luster mounted on it, and the handle, rim, etc., are of pure gold. The width is eleven inches and the length twenty-two inches. The fan among western nations is regarded as a sign of effeminacy, and few men could be found willing to wear such an ornament either in time of war or peace. Even among the orientals it is becoming a thing of the past.

ORANGE TREE FOUR YEARS OF AGE.
It was bred from a parent of known prolific habit of growth and known vigor of fruiting. Note the heavy crop which at this early age requires numerous props.

"BLOOD WILL TELL"

By

R. A. MACK

"FOR SALE — Orange trees, vigorous stock, prolific fruiting individuals, offspring of the famous 'Porterville Pride III'. Grandest tree ever produced in the Central California Citrus District. Enquire X. Y. Z."

Within the near future we may expect to see in fruit-growers' journals and similar class publications, advertisements similar to the above, since experiments which have been completed in the citrus belt in California show that characteristics of plants are quite as completely transmitted to their offspring as are the characteristic markings of cattle or of horses.

Even the layman knows that if a navel-orange bud is grafted upon the proper root stock the resulting tree will be a navel orange. It is not so generally known, however, that characteristics such as symmetrical growth, vigorous habit, prolific fruiting, and even the texture of the fruit will be transmitted from parent-tree to child.

Navel oranges are produced by grafting of tiny buds upon the bud of a tree grown from Florida sour orange seed. This particular root stock is used because the Florida sour—a wild variety—is immune from various diseases to which the navel root is subject. Until very recently the practice has been to select these buds from any of the healthy trees of any orchard, when new trees were to be grafted, without especial attention to the amount of fruit produced by the parents and with no attention whatever to such characteristics as method of growth or texture of fruit. Now, however, the progressive orchardist pays careful attention to the characteristics of the trees from which he selects the buds. As a result the present-day grower sets out his young stock with absolute confidence that the trees of the resultant mature orchard will show all of the character-

istics of those trees which were selected to serve as parents.

Scientific bud selection: the choice of parent trees, requires, at the outset, the most careful and painstaking work. The definite establishment of the rules which now govern bud selection as a matter of course required work which covered years, since an orange tree is from seven to eight years of age before it can be considered fully matured.

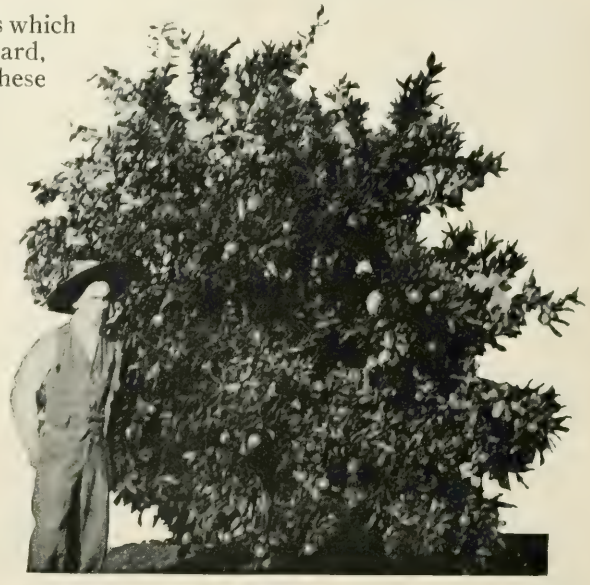
BRED FROM "SCRUB" PARENT.
Indifferent growth and fruiting of parent reproduced in offspring.

It is easy for the orchardist to walk through a grove of parent trees and select those which are vigorous, those which are characterized by beauty of growth or those which have fruit of fine texture. To distinguish between individuals all of which show a heavy fruiting characteristic, is not so easy. It is important that the buds to be used as the foundation of the new orchard should not only be selected from those trees which are the most beautiful in habit, which produce fruit of the finest texture and the greatest amount of sugar, but which produce the greatest number of pounds of fancy oranges. To determine which trees are the most valuable requires careful picking and accurately kept records.

Having selected a score of trees which are manifestly the best of the orchard, therefore, the grower designates these by number, or, if he is especially sentimental, by name. Fruit picked from each of the trees is kept by itself until graded and a detailed record is kept. At the end of the packing season these records are compared and those trees which are established as the best of the orchard are used as the parents of the new grove.

The records will show, say, that "Queen of the Orchard," a splendid individual of which the growth is almost perfect and of which the fruit is of fine texture and loaded with sugar, has produced four picking boxes of oranges, weighing three hundred pounds, of which ninety-five percent graded fancy, four percent standards and one percent culls. As this production is twenty pounds larger than that of any of the other individuals of the chosen group, "Queen of the Orchard" is thereupon designated as one of the future parents of the new trees to be budded.

Under the old system of guessing at the best trees and under the still older system of taking the buds indifferently from trees as the workman came to them, it was certain that when the new grove began to mature a certain proportion of the trees would be non-productive.



CHIEF CHARACTERISTIC HERE IS SYMMETRICAL GROWTH.
The bud from which this tree was grown was taken from the parent stock in which the same characteristic is noted.

DRY CLEANING COAL

By

GEORGE H. CUSHING

"MANY thoughtless persons still speak of coal when they mean everything which is loaded upon a pit car in a coal mine. That might have served the purpose once, but it is old-fashioned now. We know that that which we call coal is not uniform in the results given. Those who speak hastily say there is "good" coal and "bad" coal. Those who strive to use exact terms speak of it as "dirty" coal and "clean" coal. They convey a certain meaning which is fairly understood even though not quite right. You can no more speak accurately of dirty coal than you can speak of filthy cleanliness. What the commentator means to say is that the pure coal has mixed with it some of the slate that falls down from the roof of the mine; some of the bone which is found in the middle of the seam, and some of the fire clay which is shoveled up from the floor. That which is thus shipped to market is not coal at all, but a fuel mixture—an adulterated product."

THE SPIRAL SEPARATOR WHICH DISPLACES THE BOY PICKER IN THE COAL INDUSTRY.

A. Bement, the Chicago consulting engineer who thus takes the public to task for the loose use of a very common word, is literally correct even though he may have some difficulty in getting the commonality to adopt his fine distinction. He has, however, hit upon something which is rapidly changing mine and fire-room methods. Some coal sells at the mine for two dollars while other coal sells at the same mine for seventy-five cents a ton. There are several reasons for this, but one of them is that the expensive product is free from slate, bone and fire clay. The cheaper coal contains those elements in quantity. The struggle of coal producers today is to ship only the pure product to market. They are striving to avoid shipping Mr. Bement's fuel mixture, even as the coal buyers are striving to buy only coal instead of coal plus other things. At first coal producers tried to pick those impurities out of the coal by hand. This was possible when the pieces were large, but was impossible in those sizes of coal which would pass through an-inch-and-a-quarter round hole in the screen.

The next step was to separate the small pieces from the impurities by putting that "fuel mixture" through a washer. This washer is equipped with jigs which agitate the fuel mixture in water. The coal itself, being lighter, rises to the surface and is floated away into a chute leading to a coal bin. The slate, bone and fire clay, being heavier,

sink in the vat and are drawn off at the bottom to be transferred to a refuse pile. This method cleans the coal, but has its drawbacks. It will extract slate, bone and fire clay to the amount often of twelve or fourteen per cent, but puts in water or moisture to the extent of seven or eight per cent. The water burns no better than the mineral substance, hence the net result is only fair.

To ship absolutely pure coal a new method of extracting the impurities is now in use in the anthracite field of Pennsylvania, and has just been introduced into the bituminous field at West Frankfort, Illinois, in Franklin County.

The new plan dry cleans the coal by the use of a metal spiral. The principle on which this spiral works is that bone, slate and fire clay are mineral in character, and therefore, have a certain attraction or affinity for other metal, and hence will adhere to that metal. The coal, which is a vegetable compound, has practically no affinity for metal. In separating the mineral impurities from the coal, the "fuel mixture" is placed upon this metal spiral at the top and is permitted to flow down the spiral's bands. The coal, which has small affinity for the metal, will, controlled by centrifugal force, hop over the edge of the spiral into a spiral pan arranged to receive it.

The slate, metallic in character, heavy and slow, hugs the center post. The bone coal, which is less metallic than slate and far more metallic than pure coal, takes a course half way between that of the slate and the coal; it moves down the outer edge of the spiral.

Thus, by the use of centrifugal force, and of the attraction of metal for metal, the coal is separated from the impurities, the coal going into one bin, and the impurities going into another. Because the bone coal will burn, after a fashion, it is not thrown into the refuse pile with the slate, but at the bottom of the spiral, a gate diverts it to a conveyor which carries it to the boiler room where it is burned in the furnace of the mining company.

In the anthracite field, this device is used as a substitute for the "picker boys," who have loomed so large in recent sociological discussions. These boys have worked from eight to ten hours a day, sitting on small benches in a dusty room picking the impurities out of anthracite coal. With the adoption of the spiral separator their vocation is gone. On this subject one labor leader says:

"Don't worry over the fate of the picker boys; they will find something better to do, as has always been the case."

WONDERFUL NATURAL MONUMENTS

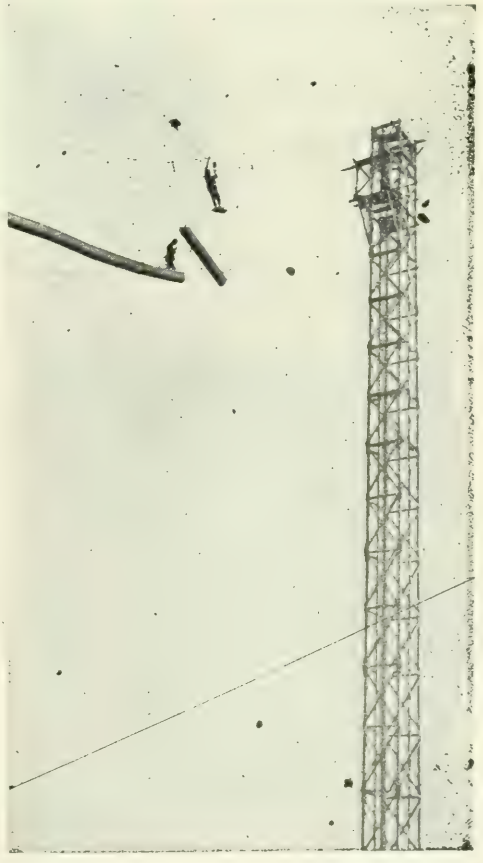
MONUMENT Canyon in New Mexico furnishes one of the most beautiful examples of freak erosions that is to be found anywhere in the country. Along its banks are precipitous cliffs, many of

NATURAL MONUMENT IN NEW MEXICO, EIGHT HUNDRED FEET HIGH.

which are studded with the one-time homes of those prehistoric cliffdwellers who once claimed the arid Southwest for their own. Other of the hills that have been eaten away by the elements take the form of fantastic castles carved in these solitudes by some architect of the dim and distant past. Still again will some spiral monument be found that lifts itself into a mighty shaft as straight and twice as high as that greatest of such structures built by man, the Washington Monument. The monument which appears in the foreground of this picture is eight hundred feet in height. The cliffs beyond are precipices of similar heights and nearly all of them contain cliffdwellings. Such scenes unfold themselves in a continuous succession to the tourist who penetrates this canyon.

PUTTING A CHUTE INTO PLACE

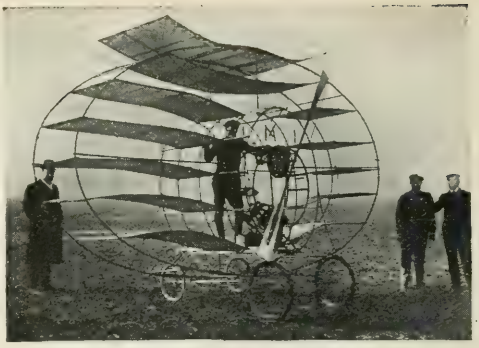
CHUTES of galvanized iron or wood are coming into general use for delivering concrete from the mixing plant to the point of deposit, taking the place of wheelbarrows and carts. These chutes are attached to a hopper at the top of a tower, the tower carrying a hoist which takes the concrete up from the mixer and dumps it automatically into the hopper. From this point it is propelled through the chutes by gravity. These chutes are held in place by trusses and cables, and the installation of them is sometimes rather a perilous task, as the accompanying photograph, taken during the construction of the Main Street Viaduct, at Houston, Texas, will bear full witness. The process is a very interesting one.



A PERILOUS TASK—SWINGING A CHUTE FOR DELIVERING CONCRETE INTO PLACE.

WILD DESIGNS IN FLYING MACHINES

THE accompanying pictures show some strange-looking flying machines, with which their inventors thought they would solve the problem of air-navigation once and for all, but as a matter of fact, they did not prove to be of any value. The machine shown in Fig. No. 2 is the invention of the Marquis d'Equeuvillay. This nobleman seems to be on pretty bad terms with the laws of the aerodynamic, as the machine shows. It consists of a very light frame-work rich in capacity of areas, strong and yet deformable at its ovalized periphery and with motor and propeller placed in the center. Every deformation of the rim and planes might be utilized for steering and balancing.



A Marquis' Idea of a Flying Machine.

A Monoplane That Was Expected to Revolutionize Aerodynamics but That Did Not.

The powerful and simple idea, that if two planes are better than one three are better than two, is embodied in a machine which has for its inventor a Frenchman, M. Bousson-Bourgnis. The abundance of rudders of generous size and of a certain flexibility in all the areas, testify to an active, energetic misunderstanding of nearly all the leading principles in successful aviation. The head-on resistance is enormous. What might perhaps have been gained by using perfectly elastic materials, shaped and proportioned so as to return an equivalent in work for the power expended in bending the planes back, is squandered through the acceptance, instead, of unresponsive materials, endowed with an inert flexibility rather than resiliency.

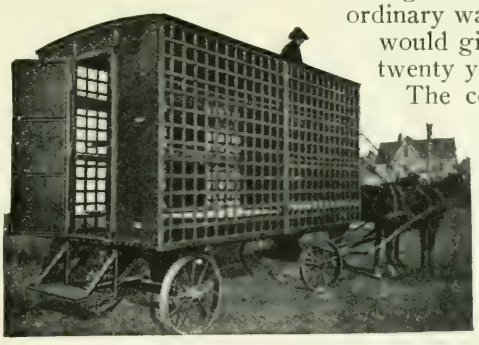
Fancy This Scow Being Sucked Forward through the Air by This Little Propeller.

The engineer responsible for another machine here shown has also tackled elongated construction, being plainly actuated by hopes of escaping from the problem of lateral equilibrium. But fancy this scow being sucked forward through the atmosphere at great speed by the innocent little propeller! It is presumed by the inventor that the bow will throw powerful air waves upward against the flying box membrane extending from the gunwale, fairly lifting the structure, and moreover that the hollow of the scow will create a vacuum—the vacuum being a highly favored phenomenon among independent aeroplane designers, being nearly always produced without special expenditure of power—to fill which a mighty upward pressure from the atmosphere underneath will automatically assert itself. More ingenuity than wisdom is used on these inventions.

Tunnels Side by Side.

TUNNELS SIDE BY SIDE

AN unusual piece of tunnel work is now under way in Los Angeles, where a second bore is being built to parallel the one at the end of Hill Street. The present tunnel is used for electric trolley cars and the new one will accommodate ordinary traffic. The new arrangement will relieve a congestion in traffic that has been perplexing for some time. The proposed tunnel will be 546 feet long with a width at the base of thirty-two feet and will cost $126,000. It is to be lined with white tile, electrically lighted and paved with wooden blocks to eliminate noise. Motor trucks are used to carry away the 20,000 cubic yards of earth which will be excavated in this "double barreled tunnel."



Jail on Wheels.

JAIL ON WHEELS

EAST POINT, near Atlanta, Georgia, has gained the distinction of being the most accommodating little city in the South. Besides having all the conveniences of city life, East Point has provided the law-breaking element with a jail on wheels, and, instead of dragging an obstreperous drunk to prison, the town constable hitches a couple of mules to the prison and drives over and loads up. On trial day the load of malefactors is towed over to the court room. This portable prison has accommodations for twelve prisoners, and is seven feet wide, seven feet four inches high, and thirteen feet long. As the state of Georgia also works its convicts on the road, pro-rating them to the different counties, the prisoners are conveyed from place to place in this cage.

GROWING TREES FROM THE TOP DOWN

THE Maine Central Railroad Company has solved the plan of getting good shade trees in a short time, though they may be small. These trees are so arranged that after two years' time they will give as much shade as the ordinary way of setting out trees would give that are fifteen or twenty years old.

The company gets a small elm tree preferably, digging this roots and all from the ground. The tree then is set, the top part being set into the ground and the roots are left in the air. The tree then grows, forms roots on what was originally the top of the tree and the original roots that now take the place of the branches begin to leave out and form a complete foliage.

This Tree Was Planted With Its Roots in the Air.

THE SCULPTOR'S ERROR

IT may be excusable on the part of a sculptor to make a technical error in designing a bit of statuary, but when a board of judges, some of whom are military men, pass by a gross error which is tactically wrong in the army, some one must have been asleep at the post.

The magnificent statue of General Sherman which stands immediately south

Statue the Soldier Boys Criticise.

of the Treasury has at its base, at each corner, heroic figures representing the different branches of the military service which participated with the general in his memorable march to the sea.

The soldiers at the northwest and southwest corners are standing in correct position, looking very lifelike but the sculptor erred in one particular. Across the shoulders of each are tied the regulation blankets; but the sculptor put them across the *right* instead of the *left.* Wherein is this wrong? Ask any man who has performed military service and he will tell you that a soldier would no more think of marching with his blanket roll tied over his right shoulder than he would of putting his shoes on his hands instead of his feet. He could never carry his gun on his shoulder or get it up into firing position were he to wear his blanket in this fashion.

Whenever there are military parades in Washington and thousands of Uncle Sam's "boys in blue" are in town, one can always see a group of them around this statue picking out the flaws.

OUR INDUSTRIOUS SOLDIERS

OUT on our Western coast the artillery soldiers have found a means to while away their idle time and make the whiling profitable. The shores of inland bodies of water are constantly covered with ever-increasing piles of wood refuse from the numerous saw mills, including dressed timber and rough logs. These latter break loose from large booms being towed to the mills and are washed ashore, and the sawed boards fall overboard at the mill or escape from sinking scows or ships, and are washed up on the beach. The soldiers of the artillery forts, which forts are always built on the shores, gather up the lumber and sell it to consumers direct, or to the mills. The logs they saw up into cord wood and sell to residents about the forts. Some of the men, after finishing their period of enlistment, go into the business of beachcombing on a determined scale by investing in good boats for towing purposes and to help them in picking up riches.

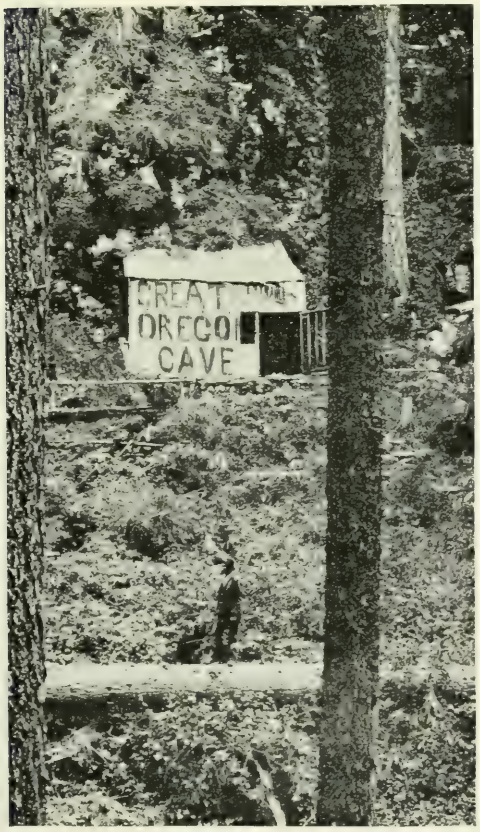
U. S. Soldiers Gathering Waste Timber to Sell.

WORLD'S LARGEST CAVES?

WHO would imagine that this crude entrance leads to one of the wonders of the American continent? The Great Oregon caves are now thought to be the largest known and on this account and because of their transcendent beauty our government has placed them under its protection.

These caves are situated south of Grant's Pass, in Cave Mountain in the Siskiyou National Forest. They have only become known of late years. When Elija Davidson was hunting in 1874 he found an opening which seemed to him remarkable. On his return he spread the news and later four floors were opened and ladders arranged so the persons can pass from room to room. The main opening is at an elevation of four thousand feet, but there are so many rooms that they have so far never been explored and one can only guess at their possible magnitude.

There are dark pools with bottomless pits, beautiful streams, projections that look like icicles, large spaces filled with a marble-like substance which is fretted to resemble flowers and drapery. It is supposed that these caves extend miles and miles, a wonderful procession of caverns filled with chambers of glittering star-like pendants.



ENTRANCE TO THE REMARKABLE GREAT OREGON CAVES.

NO MONKEY CAN CLIMB THIS TREE—THE "MONKEY PUZZLER."

"MONKEY PUZZLER" TREE

THIS is a tree that not even a monkey can climb, hence its common name "the monkey puzzler." Its branches are covered with sharp-pointed stiff leaves, laid one over the other like shingles, making it well nigh impossible for one even to touch a branch without being badly pricked. The scientific name of the tree is *Araucaria Imbricata.* It is a native of South America and Australia. It is grown also in southern California as an ornamental lawn tree where, by some, it is held in very high favor for its peculiarities.

OLDEST OF PUBLIC BUILDINGS

AN interesting building to be seen in Jackson Park, Chicago, is the Cahokia court house, reputed to be the oldest public building extant in the Mississippi valley. This ancient structure was built about the year 1716 at Cahokia, Ill., and has served in various public capacities under three flags—the French, the British, and the American. At different periods it was used for both civil and military purposes and is recognized as the oldest county seat building (St. Clair county, Ill.) in the original Northwest territory. It has been called "fort" and "garrison" by authorities of the early French, British and American periods and early documents attest to its use as a public schoolhouse. The building is constructed of squared walnut logs set on end in the early French manner of stockade construction. The logs are held together with wooden pins.

OLDEST PUBLIC BUILDING IN THE MISSISSIPPI VALLEY—NOW IN JACKSON PARK, CHICAGO.

PLENTY OF FEET

JUST what happens when an amateur takes a picture at close range is shown in this photograph of a couple of pairs of feet with a couple of persons attached to them. It is a pretty good lesson in perspective, as well. The camera man's mistake was in getting the feet so close to the lens, although the picture is more striking this way than if he had chosen a more conventional pose.

THE CAMERA WAS NOT QUITE TRUTHFUL.

HOW REDLANDS FIGHTS THE FLY

THE city of Redlands, California, carried on, the past summer, a fly campaign which was declared to be a success in mitigating the insect nuisance. The main feature of this warfare on the little disease carrier, consisted in the sidewalk traps, which were placed at the curb along the principle streets. Thousands of flies were captured and destroyed in this way as practically every merchant and many of the householders were thus equipped. These precautions, together with frequent cleaning of the streets and adequate supervision of garbage disposal and stable yards should soon make any city very nearly flyless. The double process of exterminating the insect when it has developed and of wiping out its breeding places is the only logical course.

FLY TRAPS PLACED ON THE STREETS OF REDLANDS, CAL.

TECHNICAL WORLD MAGAZINE

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The MENACE OF

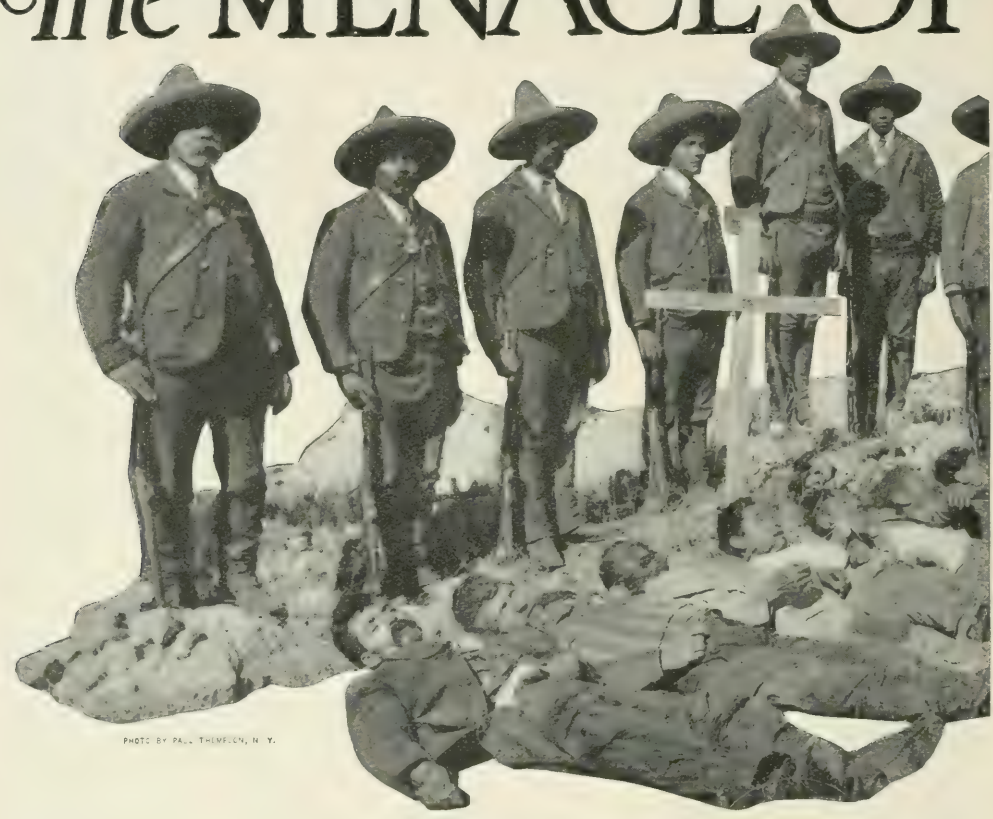


PHOTO BY PA... THEMELEN, N. Y.

For two years Mexico has been in a state of practically continuous revolution. Rival revolutionary leaders, backed, in most cases, by rival financial powers in the United States, have started revolts in the North and in the South. Hundreds of peons, bare-footed, ignorant of the very cause for which they were forced to fight, have been slaughtered. Twice regiments of the United States Army have been rushed to the frontier. Again and again, armed intervention by the United States has been urged.

In all this bloodshed and welter of intrigue and rebellion, great financial powers in this country have played a part. Many great capitalists and greater corporations have immensely valuable concessions and other interests in Mexico which will be affected, one way or the other, by the success or failure of the various revolutions. Indications are plain that certain of them are behind the repeated attempts to overthrow the Madero government in the North—the last of which was begun by the nephew of Porfirio Diaz, the deposed dictator, in October.

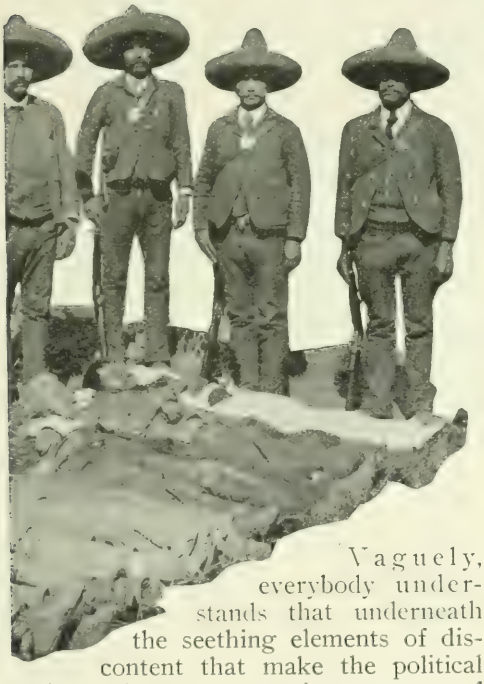
The immense and largely undeveloped natural resources of Mexico are the stakes in the game. The people of Mexico, incredibly ignorant, poor and oppressed, are the pawns. The part which the United States is playing—and is likely to play—should be of vital interest to every citizen.—*The Editors.*

JUST a little over two years ago Mexico celebrated the centenary of its freedom from Spain. It was really a celebration and testimonial of the success of Porfirio Diaz, the whole world paying its tribute to the man whose building of a nation had earned from many close students the title of the greatest American of his time.

A few short months after that celebration of peace, prosperity, and progress, Diaz was driven from his country, a broken-hearted old man. Since that celebration, revolution, brigandage, and rapine have been the order of the day. In two short years Diaz has gone, Madero has come, and now the name of Diaz again rings clear and strong. Will Madero in turn give way to another Diaz? Must the régime of the iron fist be restored? Must Mexico admit that its choice lies between exploitation by the powerful and anarchy? Must its people wait another generation, or another century, before they can begin the slow process of building on the true foundations of popular rule?

MEXICO

by Judson C. Welliver



Vaguely, everybody understands that underneath the seething elements of discontent that make the political surface, there are warring powers of high finance, of vast business interest, or international potency. But, specifically, what are they, and for what are they fighting?

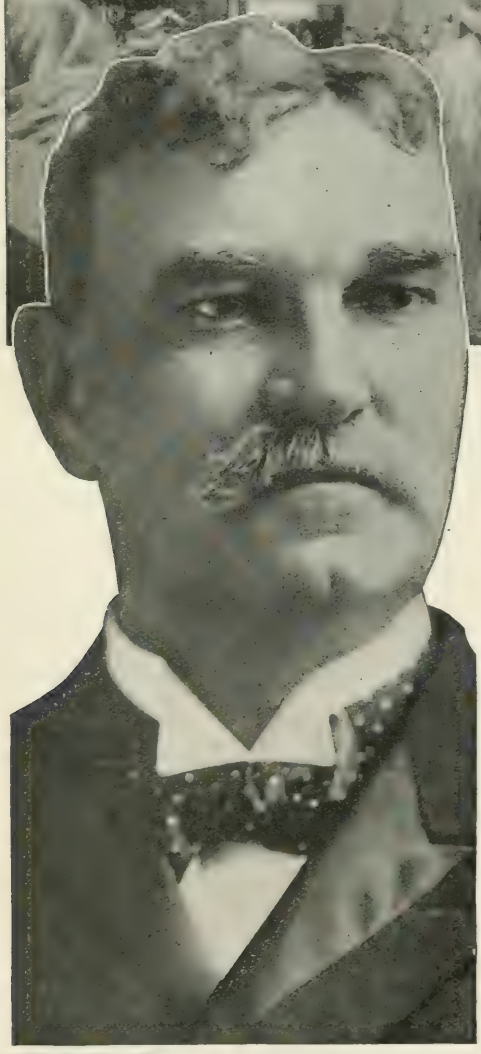
Will the United States intervene? If so, will its sympathies run toward Madero and his idealistic schemes of helping the masses of people, or toward the great concentration of business forces that seek to control the country that they may turn it into dividends?

Studying the present, seeking the future, demand survey of the past. It took Diaz two years to oust his predecessors, two more to consolidate his power. Thirty years he ruled, holding his country in mailed fist, sincerely believing himself a patriot and his the right method. He ruled, but he wanted to fit the people to rule themselves. He gave them such education as he could, unfitting them for contentment with mean conditions, yet not lifting them to the necessary understanding of democracy and its responsibilities. At last age weakened him. The material forces to which he had made such vast concessions in the hope of enlisting them in his effort, clamored on one side for more and yet more concessions. The people, with faint glimmerings of perception that they were being exploited, grew increasingly disaffected. Both greed and intelligence had grown in power, and the enfeebled arm of the old dictator could not hold them both back.

Then came Madero, scion of an immensely rich old family, American by education, idealist and dreamer by nature. He voiced the extreme aspirations of the people, sympathized with them, believed Diaz was giving too high a price in the material things of today and of all the tomorrows for benefits that an indefinite future might or might not secure. He believed in bringing capital, but not in giving the whole country in exchange for it. He saw the strong men of the Diaz cabinet grow immensely wealthy, and doubted their entire disinterestedness. His stern old grandfather, Don Evarista, and his father, Francisco Madero, had little sympathy with the dreamings of young Francisco I. Madero. Architects of the family fortune, they would let well enough alone; they treated their dependents better than most Mexican grandees deemed necessary, developed the country, diversified industry, opened mines and mills, kept out of politics, and wanted Francisco I. to do likewise.

Counsels of caution were wasted on the young enthusiast. He joined the malcontents, became the anti-Diaz candidate for President, wrote an anti-Diaz book on "The Presidential Succession," and was locked up while his presidential campaign was on. Then his family—blood being thicker than water—sent word to Diaz that if harm came to the young man, Diaz would be held responsible. Young Francisco was "defeated" in the election—and let out of jail. Even then, Diaz did not dare court the ultimate hostility of the powerful Madero family.

Market Place at Taxco.



David E. Thompson, Former American Ambassador, now Heavily Interested in Pan-American Railway.

Francisco I. Madero came to the States and proclaimed revolt; much Madero money was spent on arms and munitions. The name was magic in north Mexico, and first Chihuahua, then Sonora, Durango, and other States rose in revolt. It was a strange revolution. There is doubt whether Madero ever won a single important military success. But he managed to stay in the field, and he proved how fragile was the shell of the old Diaz power. The army had been weakened by graft, repressive measures failed, and the old system tottered to its fall. Diaz, despairing, gave up and left the country.

Francisco, the idealist, would not take the presidency save on terms that he thought would give him a chance to work out his reforms, and de la Barra, who had been ambassador at Washington, was recalled and made provisional president. He proved a great surprise. In Washington known as the most soft-spoken and courteous of diplomats, he had impressed neither Mexico nor the States as a man of big, powerful purpose. Yet he rose to the situation, and throughout the months of his provisional presidency bossed everything and everybody. Had he remained, he might have proved a new Diaz, strong enough yet mild enough. His indeed was the iron fist in the velvet glove.

During the interim of de la Barra's rule, Zapata, the rebel leader at the South, had renewed trouble in that quarter. Madero, who tried to compromise and

In a Mexican Bull Ring.

adjust matters in Zapata's interest, made his first serious mistake, for Zapata was and is an undesirable citizen with none of the lofty and unselfish motives of Madero. This mistake has haunted Madero since.

An arrangement was shortly made for an election. Bernardo Reyes, idol of the old Diaz army, came home from his exile in Paris and ran against Madero for president. Defeated, he presently tried to start a revolt, but it soon fizzled, and Reyes proved rather a Boulanger than a Napoleon. He was locked up for a sixteen-year term. Madero was now president, and the prompt suppression of Reyes seemed to start his administration under favorable auspices.

But conditions were bad. Madero had especially promised relief for the peons. He hated the old system of land monopoly by the wealthy few, and had promised the people a chance and share in the land. They in their ignorance had taken him too literally. They wanted their shares at once, and many of them calmly took it as "squatters," expecting Madero to protect them.

Complications developed on every hand. Madero believed in the United States' system of dividing administration between federal and state governments. He didn't realize how literal and insistent the masses were going to be about the execution of his pledges. Diaz had maintained a system of federal concentrations

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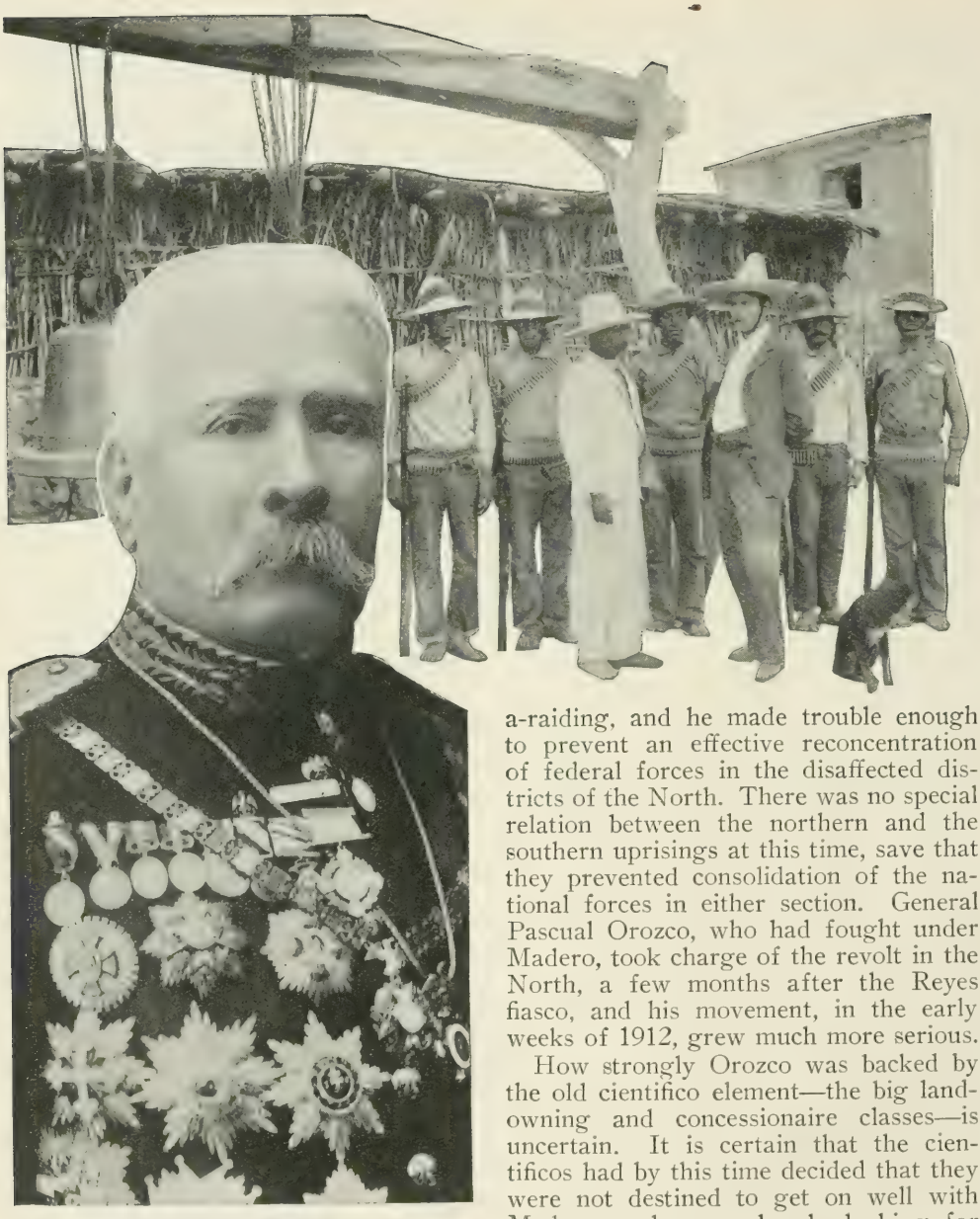
Don Manuel Calero, Mexican Ambassador to the United States.

to back the States in keeping order. Madero made the error of withdrawing federal troops from many turbulent localities, trusting to the local authorities and the sense of the people to keep order. It was as if the Washington government had taken all federal troops out of the South immediately after the surrender of Appomattox, leaving the States to reconstruct themselves. Riots and brigandage



DIAZ, THE DEPOSED DICTATOR.

defied the helpless State authorities, many of whom, representing the old Diaz "cientifico" régime, were at best none too loyal to Maderist ideas.

Still Madero might have kept his grip firm enough, but for the renewal of Zapata's outrageous activities in the South. This fine old robber baron, forgetting Madero's efforts for him, went a-raiding, and he made trouble enough to prevent an effective reconcentration of federal forces in the disaffected districts of the North. There was no special relation between the northern and the southern uprisings at this time, save that they prevented consolidation of the national forces in either section. General Pascual Orozco, who had fought under Madero, took charge of the revolt in the North, a few months after the Reyes fiasco, and his movement, in the early weeks of 1912, grew much more serious.

How strongly Orozco was backed by the old cientifico element—the big land-owning and concessionaire classes—is uncertain. It is certain that the cientificos had by this time decided that they were not destined to get on well with Madero, and were already looking for trouble. Orozco was strongly backed financially, and all the support he got represented cientifico sympathies. He won early successes, got together a very respectable force of several thousand men, controlled Chihuahua, and by taking Juarez secured a port of entry for arms and supplies from the States.

Then Congress, at Washington, dealt a death-blow to Orozco's movement by adopting a resolution authorizing the

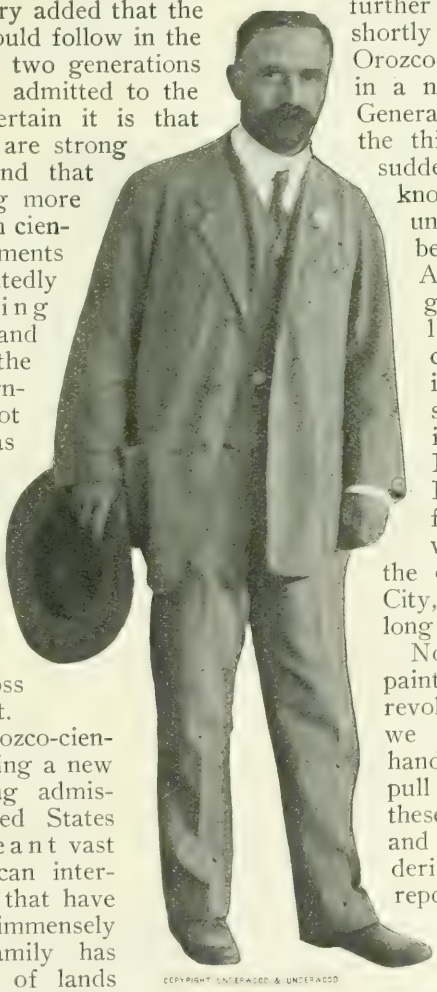
President to prohibit, by proclamation, export of military supplies to a neighboring country where there was trouble. The proclamation issued, Orozco had no further use for Juarez. So he abandoned it and engaged in a campaign of border warfare and pillage, finally starting on a desperate effort to march through the Sonora mountains to the Pacific coast of Mexico.

There was persistent report about this period—the early summer of 1912—that a gigantic plot was afoot to have the northern and northwestern States of Sinaloa, Chihuahua, Sonora and Lower California secede from Mexico and establish a new republic. The rumors which were whispered abroad from juntas in this country added that the new government would follow in the footsteps of Texas, two generations ago, and ask to be admitted to the United States. Certain it is that American interests are strong in those States, and that Orozco was getting more or less backing from cientifico or other elements that have repeatedly threatened to bring about intervention and occupation by the Washington Government. But this plot —if it really was plotted — evaporated with the Orozco revolt. It simply vanished into the air, after the effort was made to march the revolutionary army across to the Pacific coast.

This alleged Orozco-cientifico plan of starting a new Texas and seeking admission to the United States would have meant vast profits for American interests in the States that have been named. The immensely rich Terrazas family has millions of acres of lands there; and American affiliations that have long been suspected of great influence at Washington; the interests that were introduced into that part of Mexico through the activities of Col. William C. Green of "Green Consolidated Copper" fame, and various other groups, have always been mentioned in discussions of this plot. The Southern Pacific has vast interests in that region; and Arthur E. Stilwell's Kansas City, Mexico & Orient railroad, now in receivers' hands, represents big investments that would profit vastly by intervention and annexation. But this complication of moneyed interests must be considered later.

That Orozco and his—for a time —very menacing uprising represented the cientificos and the financial forces, is further indicated by the fact that shortly after the collapse of the Orozco movement, another started, in a new quarter. This, led by General Felix Diaz, a nephew of the thirty-years' dictator, started suddenly and, so far as is yet known in this country, most unexpectedly, only a few days before this article was written. All the circumstances suggest to those who have followed Mexican affairs closely, that the Diaz uprising was put out when it was seen that Orozco had failed in the hope of overturning Madero's administration. Diaz is notoriously and frankly backed by his uncle's wealth and affiliations and by the cientifico group at Mexico City, which fattened during the long Diaz régime.

Now for a glance behind the painted scenery of brigandage, revolution, and turmoil, to see if we may discern some of the hands that shift the pieces and pull the strings which actuate these military puppets of revolt and uprisings. During the Maderist revolt it was common report in the States that the Madero family was backed by Standard Oil interests; that vast Madero oil properties had been taken over by the Standard group, and



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PRESIDENT MADERO OF MEXICO.

FELIX DIAZ, LEADER OF THE LATEST REVOLUTION.

in the deal the Maderos had raised the ready cash to carry on Francisco's warfare. It was alleged that Henry Clay Pierce, head of the great Waters-Pierce oil company and probably the ablest man in the entire oil business today, barring none, had concluded to oust the old Diaz-cientifico régime, set up the Maderos, and give Mexico a more enlightened government. All this was probably sheer bosh. Mr. Pierce has vast interests in Mexico; perhaps more than any one man, he contributed to make possible the consolidation and nationalization of the Mexican railroads. The Maderos he regarded as the representatives of the most enlightened policy in Mexican matters, the likely saviours of the country if it could be saved. Yet I am assured, on authority that forces me to believe the statement, that Mr. Pierce maintained neutrality throughout the Madero uprising. Just recently, through the struggle between Pierce and the Standard interests for control of the Waters-Pierce company, it has fallen out that there is no necessary community of policy among these big powers of petroleum, and therefore it is not so difficult as it would have been a few months ago to believe that Pierce might take one view, and Standard Oil another, in Mexican matters. At any rate, the best information available is that, so far as concerns the oil industry in Mexico, Pierce has been neutral, but friendly toward Madero. On the other hand, the Standard Oil group proper is to be set down as distinctly hostile toward the Madero program.

The Standard Oil forces seem to come into the Mexican situation through the activities of the famous London firm of Pierson & Son, Limited. This firm built the Tehuantepec railroad for the Mexican Government, incidentally making immense profits on it, and now operating it under an arrangement with the Mexican Government. Lord Cowdray, head

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of the Pierson concern, was very intimate with the Diaz administration, got immense concessions and contracts — including his railroad deal—from it, and did all he could to hold up the hands of the elder Diaz. It has been alleged that he went so far as to try to shape international conditions so as to force American intervention to destroy Madero and sustain Diaz.

This firm of Pierson & Son, Limited, assumes a very real interest, in our study of international relations in Mexico, when we observe next that for several years past—since about the time when William H. Taft became President of the United States—Henry W. Taft has been a director in Pierson & Son, and their general counsel in the United States. Henry W. Taft is a New York lawyer and brother of the president. He is a member of the same firm—Strong & Cadwalader—of which Attorney-General Geo. W. Wickersham was a member when he retired from active

HENRY W. TAFT, BROTHER OF PRESIDENT TAFT, AN IMPORTANT FIGURE IN MEXICAN AFFAIRS.

He is the man whom Madero is most concerned about.

WM. W. CANADA, U. S. CONSUL AT VERA CRUZ.

practice to become head of the Department of Justice.

Now, recollecting these connections of Henry W. Taft with Pierson & Son, Limited, turn to another big Mexican concern: the American-Hawaiian Steamship Company. This was an enterprise, originally, of Charles R. Flint, of New York, started about the end of the last century, handling business from the Pacific to the Atlantic coast, to and from the Hawaiian islands, etc. It was a great success from the start, expanded fast, and was highly profitable. After it had been in operation a few years, the Tehuantepec railroad was opened, affording the shortest route across the continent north of the Isthmus of Panama. The American-Hawaiian company secured from the Diaz Government a contract for the handling of business between the east and west coasts of the United States, by way of the new railroad. This contract has been immensely profitable to the steamship company—and Henry W. Taft, brother of our president, is likewise become a director in *that* company!

Similarly, Henry W. Taft is a director and general counsel for the United States of the National Railways of Mexico.

Down in Mexico there is a strong belief, among supporters of Madero, that Henry W. Taft, thus powerfully placed with the great concessionaire and financial interests that Diaz favored, and at the same time a brother of President Taft, is the most important man alive, in financial-political affairs that concern Mexico. He is the man whom the Madero people are most concerned about; the man whose enmity they most fear. They know that the elements with which he is associated were friendly to the old Diaz power; they know that the cientificos and the rest of the Diaz adherents never welcomed Madero, and would be glad to see him turned out today. They don't know what hand Henry W. Taft is playing; but they would rather see to the bottom of his mind, than to know what William H. Taft, or Philander C. Knox, or anybody else in the United States, is planning for the future of Mexico.

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ENGRIQUE CRAL, DIAZ'S AMBASSADOR TO WASHINGTON.

When President Taft ordered the army mobilized on the Mexican border, the Maderists regarded it as evidence that the cientificos had managed to enlist, at last, the support of the United States for the expiring Diaz régime. The events certainly did not justify their fears, for Madero went on his way, there was no intervention, and there has been none. If the concentration of American force on the border was expected to overawe the opponents of Diaz, it failed of its purpose.

Where does the Standard Oil interest, as distinguished from the Waters-Pierce concern, come into this situation? As already said, through Lord Cowdray's activities, according to the story that is circulated in quarters where Mexican inside gossip prevails. Among the concessions that the Pierson group secured from Diaz, was a very valuable one, giving them the right to develop oil throughout most of the national lands of Mexico. This concession has been the object of intense antagonism in Mexico.

Within the last two years there have been repeated and circumstantial reports that Lord Cowdray was conferring, in New York, with Standard Oil people. These conferences are located at the Standard Oil general offices, No. 26 Broadway, and other places. Henry W. Taft is named as having participated in some of them, in fact, in most of them, and to have had an important part.

As a result of these conferences, so

HENRY LANE WILSON, U. S. AMBASSADOR TO MEXICO.

Mexican-American authorities allege, a contract was made by which the Standard Oil interests are to handle the crude-oil products of the Cowdray-Pierson group. Certain it is that Standard refining interests in Mexico are expanding — and recently there has been report that crude oil is going up in price!

These names do not begin to suggest all the powers of American business and finance that are deeply concerned in Mexico, however. John Hays Hammond, friend and adviser of President Taft, represents immense investments in mining and land holdings in Mexico. His visits there are frequent, and the suggestion, which they convey, of Guggenheim interests in developing the almost unimaginable mineral wealth of Mexico, is said not to be at all misleading.

David E. Thompson, former ambassador from this country to Mexico, was instrumental in the enlistment of another American group in Mexico. Thompson was very influential with the Diaz administration, and he, with Paul Morton and other associates, made a huge profit by acquiring control of the Pan-American Railway, partly in Mexico and partly in Central America. Immensely valuable concessions were given to them by the Government, and they are always catalogued with the financial forces that possess affiliations with the cientifico group and international influence.

Summarizing all these business and financial factors, the statement was recently made that the Standard Oil forces "have always kept out of politics in Mexico; but if the Felix Diaz revolution succeeds in deposing Madero, what the Pierson-Standard Oil interests don't get in Mexico will not be worth having."

Such, in very brief, is a summary of the story of Mexico to date. There is intimation that a new effort will be made to secure American intervention. A subcommittee of the United States senate's foreign affairs committee is investigating the general Mexican situation at this time, headed by Senator William Alden Smith of Michigan. President Taft has said that he will in no circumstances intervene without putting the matter up first to Congress. The temper of discussion in the last weeks of the recent session justified decidedly the belief that conditions would have to be vastly worse than they have ever been yet, to induce Congress to give its word for armed intervention.

FRANCISCO DE LA BARRA, PROVISIONAL PRESIDENT OF MEXICO.

The attitude of the United States toward Mexico has been the very gravest concern to the Madero party from the beginnings. The cientificos have been disappointed that our Government has done so little to sustain them, and the Maderists have been on the whole pleased, thus far, that it has done no more than it has, to their disadvantage. In the spring of 1911, when the Madero revolt was at its height, President Taft concentrated a big force in Texas and the Madero people believed that this was brought about through the influence of American business and financial powers. The moral influence of that move was expected, by most people familiar with Mexico, to favor Diaz. The actual effect on Mexican affairs was small. Powerful influences sought to induce President Taft to intervene at that time in behalf of Diaz, but they failed. The President refused to take the step for the time at least; Madero got his second wind, the federal fabric suddenly collapsed, and soon after, during the period of order that continued during the provisional presidency of de la Barra, the American troops were removed. A much smaller

force was ordered back to the international line during the Orozco uprising; but it was never more than a moderate patrol for the boundary, not even strong enough entirely to stop smuggling.

Considering the intimate influences that have been in position to pour interested counsel into the ears of President Taft, it is but fair to say that this Government has maintained a steadier keel and more judicial attitude than might have been expected. But none the less, Washington has never been out of the uppermost thoughts of Mexicans of all parties and factions. The old régime has persisted in hoping for succor from that quarter; still entertains the hope; even today trusts that the new Diaz revolt may bring Washington, somehow or other, to the rescue of the old order and the discomfiture of Madero. It violates no confidence to add that so long as Taft is President, the struggling Madero progressives will live in constant fear of what Washington may do.

Conditions in Mexico are thoroughly bad. The agricultural regions of Chihuahua stand in much the same relation to the revolutionary activities in northern Mexico, that the rich Shenandoah valley sustained to the southern Confederacy. Sheridan declared he would make it necessary for a crow, flying down the Shenandoah valley, to carry his rations. He almost did it; and the various marauding and revolutionary campaigns have treated Chihuahua in much the same fashion.

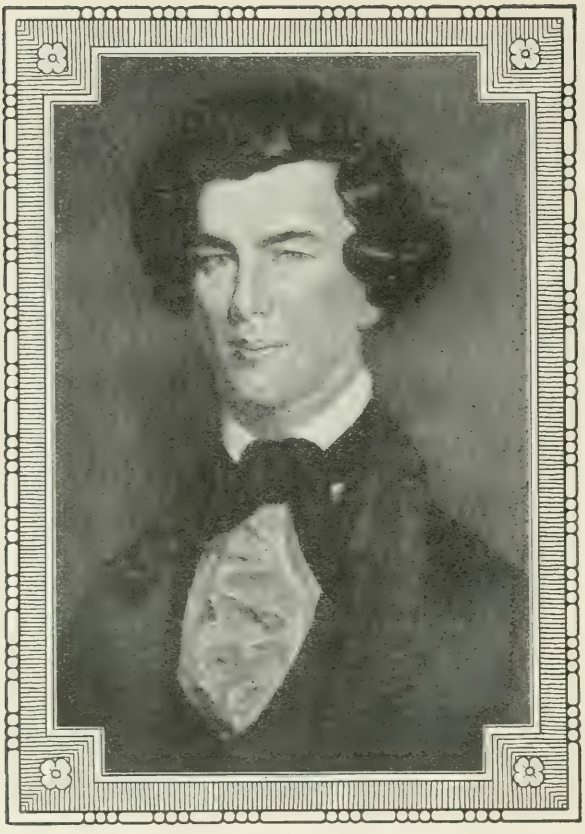
What of Francisco I. Madero? Let it be remembered that from the time he became President, he had an unfriendly congress on his hands until a very few weeks ago, when a new one, elected the past summer, came into office. It con-

JOHN HAYS HAMMOND, CLOSE FRIEND OF PRESIDENT TAFT, WHO REPRESENTS AND OWNS VAST MEXICAN INTERESTS.

PHOTO BY UNDERWOOD & UNDERWOOD

HOME IN JAUREZ, DAMAGED BY REBEL ARTILLERY.

tains a majority pledged to support him, and gives him his first real chance to secure reform legislation. Madero believes in doing things in orderly, constitutional manner. He needs laws before he can carry out the land and taxation reforms he has promised. If he can sustain himself long enough to get them and show some results; if he can hold back the ignorant masses of his countrymen with one arm and the rapacious cientifico-capitalists' interests with the other; if Pierson, Standard Oil, and other powerful forces in the business world do not decide against him, and then by dint of backing revolutionary activities force intervention and depose him;—if Madero escapes all these dangers and gets the country pacified to the extent that he can get a fair chance with his reform measures, then Mexico will have a chance, Madero will have a try-out, and we shall know whether the country has within it enough elements of stability, of intelligence, and of character, to make it a real nation.



WILLIAM MARSH RICE.
From a painting made when he was thirty-four.

GREAT NEW SCHOOL FOR TEXAS

By

LESTER B. COLBY

AFTER twenty-one years of planning, a board of seven members, self-perpetuating and elected for life, has brought into existence the Rice Institute of Houston. With a class of fifty-nine students, a faculty of eleven members, and wealth approximating $10,500,000, the institution entered upon its first school year September 23.

Among the notables present at the dedication were Sir William Ramsay, the world famous English chemist, who in 1904 was awarded the Nobel prize, Prof. Hugo de Vries, the foremost student of flower life in all Europe, Prof. Senator Vito Volterra, of Rome, foremost in the field of celestial enginering, and Emile Borel of Paris, member of the French Academy.

About 175 colleges and universities in all were represented at the opening dedication, those farthest from home being the University of the Philippines, the Technical High School of Stockholm, Sweden, the South African School of Mines and Technology, and the Royal Society of New South Wales, Australia.

MEN'S DORMITORY, RICE INSTITUTE.

The story of the growth of the Rice Institute from an idea in the mind of an aged and rich Texas landowner is a long one both in years and romance. William Marsh Rice, who had accumulated great wealth by coming to Texas in the early days, acquiring cheap lands and seeing them increase a thousandfold in value, is the man who gave the institution to Houston—and to Texas.

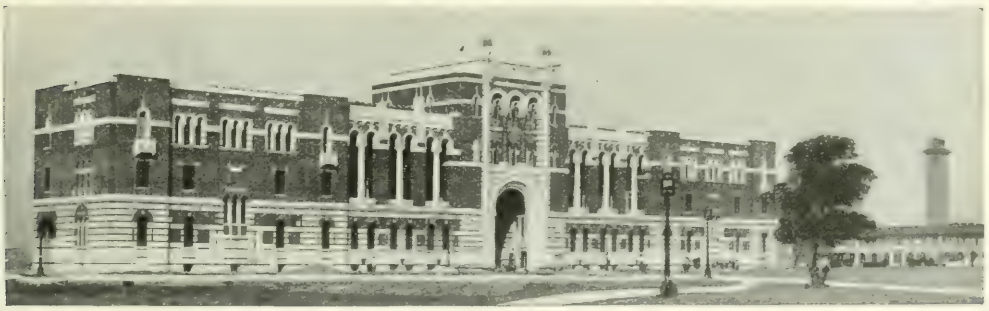
A quarter of a century ago he was approached by a committee of business men who requested that he give a few hundred dollars to the city as a part of a fund being raised by public subscription, to assist in establishing a high school. He refused, declaring that it was the public's business to look after its own schools and children.

But in the interview the seed was sown. Some time later he sent for the committee and said that he had evolved an idea which, when the time came, would give the city a school beyond its fondest dreams and which would be free to all ambitious young men and women. He then outlined to them his ideas of such an institution. It was to be a great school for the masses. It was to be non-sectarian and non-political and it was to teach the liberal and technical arts. In 1891 he made over an interest-bearing note for $200,000 and named the board of trustees which was to hold membership for life.

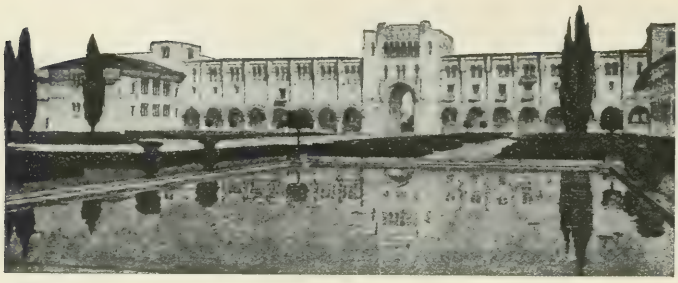
This board consisted of himself, F. A. Rice, A. S. Richardson, James A. Baker, Jr., J. E. McAshan, Emanuel Raphael, and Cesar Lombardi. Of this board the first three named are dead and in their places have been elected instead William M. Rice, Jr., B. B. Rice, and Dr. Edgar Odell Lovett, President of the Institute.

Nine years after the organization of the original board, or in 1900, William M. Rice was found dead in New York under mysterious and tragic circumstances. It is for his death that his attorney-secretary, Patrick, is serving a life sentence in Sing Sing.

After several years of litigation, the Institute came into possession of several millions of dollars worth of property which was rapidly increasing in value. It was not until nine years after the death of Mr. Rice that the building of



ADMINISTRATION BUILDING, RICE INSTITUTE.



COURT, WITH ADMINISTRATION HALL IN BACKGROUND.

the institution began to assume tangible form. In 1909 Dr. Edgar Odell Lovett, then of Princeton University, was made president of the school. His first duty was to start on a year's pilgrimage of the world with a secretary in attendance. The board told him to visit every center of learning on the face of the globe.

He was instructed to gather information useful in building the model educational institution of the world. His efforts were meant to be thorough, for his journey took him even to China and Japan. As a result of his research a most remarkable institution is fast being raised upon what a little more than a year ago was a "cow pasture" on the outskirts of Houston.

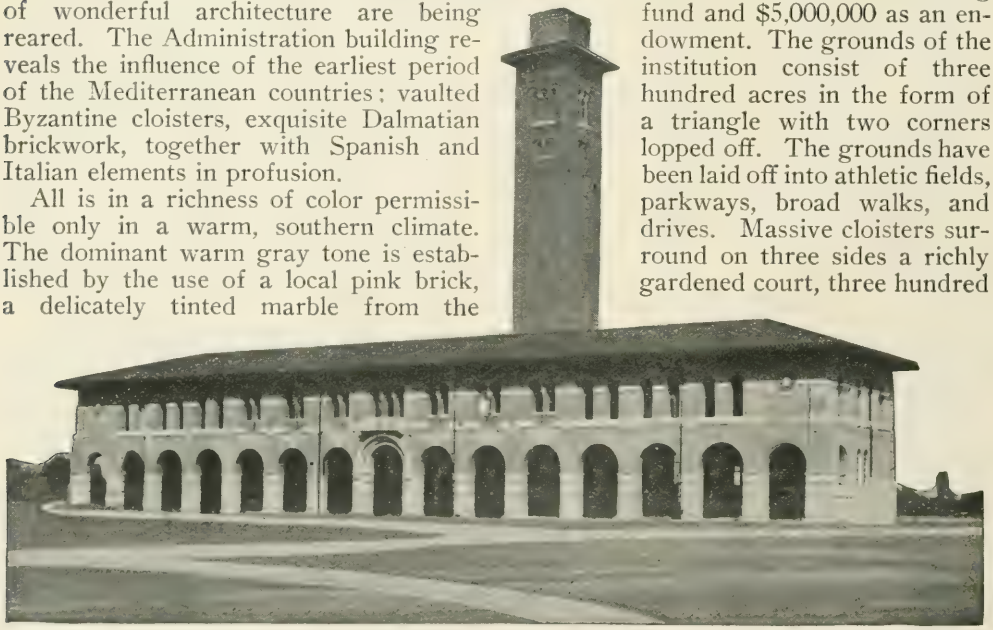
Here on the level plains massive piles of wonderful architecture are being reared. The Administration building reveals the influence of the earliest period of the Mediterranean countries; vaulted Byzantine cloisters, exquisite Dalmatian brickwork, together with Spanish and Italian elements in profusion.

All is in a richness of color permissible only in a warm, southern climate. The dominant warm gray tone is established by the use of a local pink brick, a delicately tinted marble from the Ozarks, and Texas granite, though the color scheme undergoes considerable variation by the studied use of tiles and foreign marbles.

The buildings are pierced by loggias and many windows and the cloisters are subtly suggestive of the historical Spanish monasteries. The inscription on the cornerstone is a Greek quotation in Byzantine lettering from the Praeparatio Evangelica of Eusebius Pamphili. Its English translation is: "'Rather,' said Democritus, 'would I discover the cause of one fact than become King of the Persians.'"

The impressiveness of the saying is emphasized by the fact that to become King of the Persians in that day was to rule the world.

The plans of the Institute call for the erection of about fifty buildings. This is made possible by the division of the moneys of the school into two parts. Of the more than $10,000,000 at command approximately $5,000,000 has been set aside as a building fund and $5,000,000 as an endowment. The grounds of the institution consist of three hundred acres in the form of a triangle with two corners lopped off. The grounds have been laid off into athletic fields, parkways, broad walks, and drives. Massive cloisters surround on three sides a richly gardened court, three hundred



MECHANICAL LABORATORIES, RICE INSTITUTE.

by five hundred feet, planted with graceful cypresses. This is entered through a sally-port which pierces the Administration building.

Beyond this first court is still another court of greater dimensions, planted with live oak trees. This court in turn opens into Persian gardens, beyond which the vista is closed at the extreme west by a pool and the amphitheater of a Greek theater.

The aim of the board of trustees is to establish in Texas a university as fine as can be found in the land. Everything has been arranged with a view to maintaining high standards in the school. Only freshmen were received for the first year and the entering class will have the unique distinction of being "upper classmen" during the entire four years.

Texas has given a striking instance of its remarkable progress in the paths of culture. Moreover, it has shown that the South has become one of the world's centers of learning.

WILLIAM MARSH RICE.

The school lies three miles from the center of Houston and is reached by an electric car line which pierces several big ranches. Even as the massive piles of the "future educational center of the Southwest" rise from the sun-flowered pastures, the cattle herds browse outside the fences and poke their noses over the newly planted hedge rows which surround the grounds.

With its $10,500,000 endowment, which is likely to increase largely in value, the school starts its existence as the seventh richest university on the continent. The figures of the "Big Eight" are given as follows:

Columbia University	$38,192,000
Leland Stanford, Jr.	30,000,000
University of Chicago	26,690,824
Harvard University	22,000,000
Cornell University	15,411,000
Yale	13,839,000
Rice Institute	10,500,000
Northwestern University	9,100,000

WORLD FAMOUS SCIENTISTS IN PROCESSION.

TO SAVE $500,000,000 A YEAR

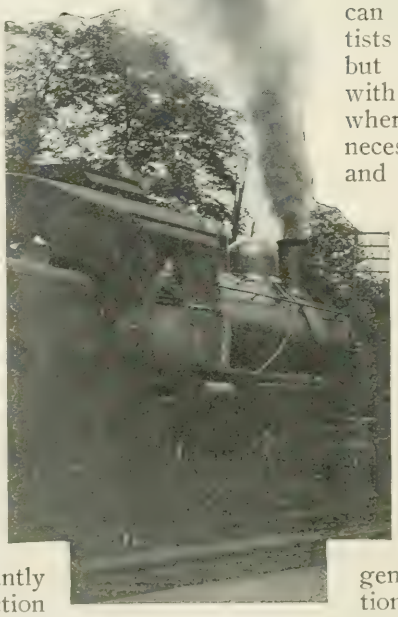
By

HENRY M. HYDE

NEAR the bottom of the gaunt hillside, up which climb the new buildings of the University of Pittsburg, stands a tiny concrete shed. It looks like a slightly glorified chicken coop or the cabin of some casual shanty-dweller. From the roof of this shed, a round smokestack extends some twenty feet into the air.

Insignificant as the building appears, it is the experimental laboratory of a corps of scientists who are working on a problem which involves the possible saving of five hundred million dollars a year to the people of the United States.

For years, Pittsburg has boasted the nickname "The Smoky City." For years its great industries, chiefly based on the uncontrolled consumption of soft coal, have added to the great fortunes of a multitude of absentee millionaires. During the same years and still today poured out through the myriad smokestacks of these great factories, two hundred tons of soot per year have settled down on every square mile of the surrounding territory. For a long time it was ignorantly supposed that the production of vast clouds of smoke and soot were the necessary accompaniments of manufacturing prosperity. Only within a comparatively recent time has there been a serious complaint about what is sometimes amusingly called "The Smoke Nuisance."



RAILROADS ARE RESPONSIBLE FOR ONE HALF OF THE SMOKE NUISANCE.

Being first among smoke offenders, it is fitting that Pittsburg should be the first to take serious steps towards the solution of what is now admitted to be a tremendous and really vital problem.

About a year ago, one of the great Pittsburg families of multi-millionaires set aside $50,000 a year for a series of years to be spent under the auspices of Dr. Robert Kennedy Duncan, Professor of Industrial Chemistry in the University of Pittsburg, in a scientific investigation of the whole question. Not only are Dr. Duncan and his associated scientists to investigate the subject, but they are charged also with the devising of some plan whereby the production of unnecessary volumes of soot and smoke may be prevented.

The corps of men which has been gathered together to attack this problem is formidable in size and the reputation of its members is such that it is fair to expect by far the most effective work which has ever been done in the direction of abating one of the most serious nuisances of city life. Under Dr. Duncan's general guidance, the direction of the campaign is in the hands of Dr. Raymond C. Benner who has personal

Soot Clouds That Shame American Cities.

charge of the chemical analyses. With him is associated another chemist, six physicians who are studying the vital problem of the relation of soot and smoke to the city's health, a number of architects who are engaged with the conditions and limitations which smoke and soot place upon the architectural features of the city and upon its building material, and a squad of mechanical engineers whose business it is to make personal examination of every plant in the city for the purpose of testing various methods of preventing or cutting down the discharge of smoke.

As a necessary step in any campaign against smoke and soot, these crusaders have started an educational campaign for the purpose of arousing a long-suffering people to a full realization of the actual loss in money, time, and health to which they are subjected by the greedy or ignorant selfishness of manufacturers, not only in Pittsburg but alike in Chicago, in Cleveland, and in a hundred other towns and cities. They point out, for instance—as the result of their chemical analysis—that the soot thrown off in actual tons by the smoking chimneys contains not only carbon—lamp black—which is the base of black paint, but also quantities of tar and of sulphuric and other acids, to say nothing of small traces of arsenic. The carbon is dirty, the tar is sticky, and the acid is corrosive, eating into whatever it may be deposited on.

Over the foliage of trees and plants growing in one of these smoky neighborhoods a coat of tarry paint is deposited which interferes with the breathing of the plant by stopping up the stomata; shuts out the sunlight; and even partially destroys, by the action of its acid content, the surface of the leaves.

As every resident of a smoky city knows, the soot deposited covers windows and skylights with an impenetrable curtain, doubles the cost of painting, eats into the polished surface of stonework, and corrodes and oxidizes metals which are exposed to the air. In Pittsburg, it costs 25% more for the necessary janitor service in office buildings than in cities which are free from the curse of smoke. In one such building, the monthly bill for cleaning windows alone is $320.

The smoke damage to delicate goods exposed for sale is very large. One such department store estimates its losses from soot at not less than $30,000 a year. Careful and exhaustive investigations made in Pittsburg show that the present uncontrolled belching production of sooty smoke adds on an average of $20 a year to the individual cost of living in that city. Laundry bills, for instance, are at least double what they would be in a community with a normal atmosphere.

Three years ago, the Chamber of Commerce in Cleveland found that the smoke nuisance added $12 a year to the high cost of living for every inhabitant of that city. In Cincinnati, careful

estimates are to the effect that every family within its sooty borders pays $100 a year as tribute to its careless and selfish manufacturers.

Herbert W. Wilson, formerly Chief Engineer of the United States Geological Survey, is authority for the statement that, taking the country as a whole, $500,000,000 damage is done yearly by the unchecked and unregulated discharge of smoke.

Very serious is the effect of constantly breathing soot-laden air upon the health of the residents of our great industrial cities. It is the consensus of medical opinion that smoke increases the prevalence of diseases of the throat and lungs and that it is sometimes even responsible for the spread of acute infection. Indirectly, also, smoke may affect the health of the community by its effect upon general weather conditions. In London, for instance, where soft coal is generally burned, scientists have estimated that the smoke cloud is responsible for at least 20% of the famous London fogs and in every smoky city, the sunlight is cut off and the heat of summer days is greatly increased.

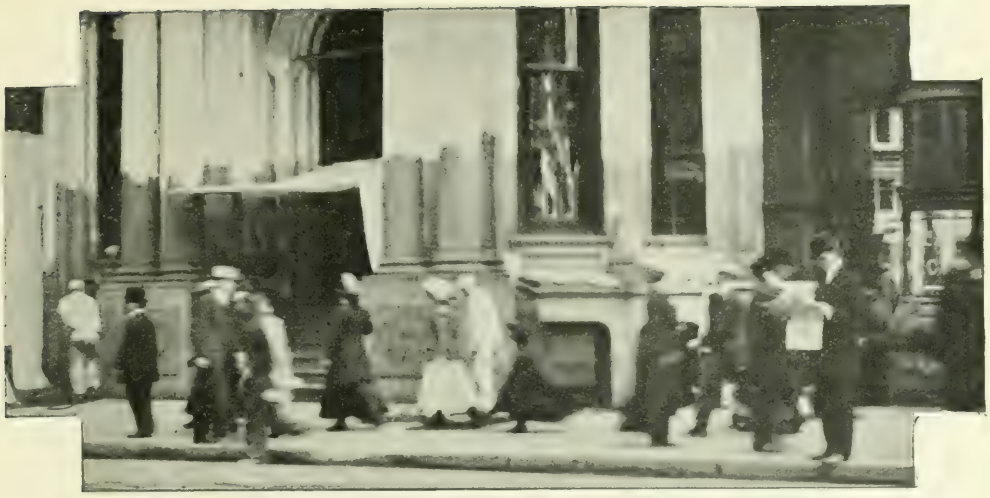
Washing the Face of a Sky Scraper.

The Pittsburg investigators are also gathering together the results of similar work done in other parts of the country. Thus they find that in Chicago it has been determined by most painstaking observation that the smoking engines of railroads entering the City are responsible for not less than 49% of the soot which befouls the air. From the chimneys of steam power plants and special furnaces comes 40% more of the total, leaving the small remainder to be divided among half a dozen other offenders.

By way of remedy, it has been pointed out that the electrification of railroads entering our industrial cities would at once cut down the total discharge of smoke and soot about one half. Almost all the remainder can be done away with by proper methods of stoking or by certain changes in the construction of the furnace which will give sufficient draught to entirely consume the volatile products of the coal.

An interesting result of experiments tried in the laboratory of the investigators is the construction of an electrical device by the use of which practically every particle of solid matter escaping from a smoking chimney can be instantly deposited. This, however, is too expensive a proposition for general use. In another direction, however, progress has been made which promises to be of the greatest importance.

The executive heads of great factories, which are constant offenders in the direction of smoke production, frequently argue that they should not be blamed, because it is impossible for them to know when their minor employes do not properly attend to their duties in the furnace room. By means of an electrical device which operates automatically, it has been arranged that whenever smoke is discharged from a chimney a bell shall be rung not only in the engine room but also in the private office of the superintendent of the plant, thus giving him instant warning that his firemen are delinquent and at the same time affording a permanent record of the length of time during which the chimney smoked. This device is simple and can be cheaply installed and costs little to operate. It would seem that its general adoption



EXTRA EXPENSES OF CLEANING CAUSED BY SMOKE.

would do more than anything else within reach to cut down the discharge of smoke and make the great industrial cities of America more fit for human residence.

Men rattle their chains to show that they are free.

There is no great genius without a tincture of madness.

The winds and waves are always on the side of the ablest navigators.

Whoever has even once become notorious by base fraud, even if he speaks the truth, gains no belief.

COLLEGE FOR EGG BUYERS

By

F. G. MOORHEAD

The American hen and her products produce more wealth yearly than all the mines in the United States. Eggs alone are worth $160,000,000 annually. Let no one sniff, then, at the idea of higher technical education for egg buyers—The Editors.

IF a hen and a half lay an egg and a half in a day and a half, how many —Wait a minute. The important thing is not how many eggs the busy American hens lay, but how many of those eggs reach the home and table of the consumer while they are still fresh. Too many egg eaters, who never even heard of Shakespeare, are being obliged to paraphrase Hamlet daily because of "something rotten," and not in Denmark, either.

After having spent the last dozen years in teaching the American hen how to lay more eggs, Professor W. A. Lippincott, of the Kansas State Agricultural College, is now busily engaged in teaching the American egg buyer how to distinguish between good eggs and bad eggs. He is devoting his time to teaching the middleman to know, and to buy, eggs while they are still eggs, nothing more.

The first egg candling school ever conducted in this country was held by Professor Lippincott at Wichita, Kansas, last summer. The series included similar schools, of four days duration each, in Salina, Manhattan and Atchison. All told, 120 egg buyers attended these schools, each buyer being given the individual attention of an expert egg candler one half day. Each of the 120 men who stand between the American hen and the American omelet and "straight up" fry was given scientific instruction in the fine art of seeing through a shell and telling whether the enclosed egg is of that freshness and purity which entitles it to be vended as "strictly fresh."

"We held the egg candling schools to meet the demand for information on candling that merchants over the State have been asking for," explains Professor Lippincott. "The time has passed when anything in a shell sold for an egg. It is common custom now to throw out eggs with black rot. They are easily detected from fresh eggs. But to cull those with rings, spots or shrunken eggs is not so easy. They often are passed by unnoticed. Those who attended our candling schools learned to detect all the bad ones. The standard of market eggs not only in this State but throughout the country generally will be raised wonderfully when candling becomes more general, as it eventually must and will."

FOR FIFTY CENTS A YEAR PER CAPITA, PROF. W. A. LIPPINCOTT PROPOSES FRESH EGGS FOR EVERYBODY.

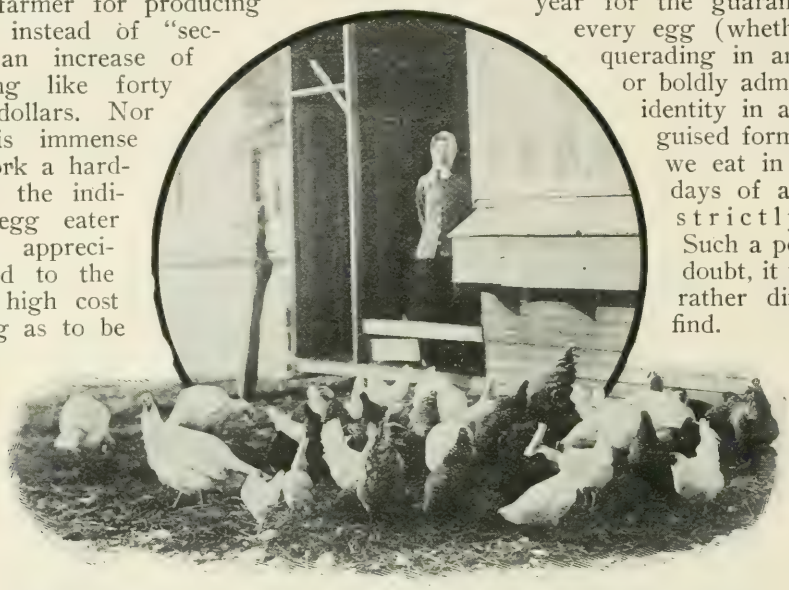
Determining that the egg buyer must co-operate with the hen if the best results are to be obtained, Professor Lippincott set about his "fresh egg" crusade in a systematic manner. He addressed letters to "Mr. Egg Buyer" in every store and shop in every city,

town and crossroads village in Kansas. This letter called attention to the fact that the trend of the egg industry in Kansas seems to be toward buying and selling on a strict quality basis, while the tendency is even more marked in other States. He pointed out that strictly fresh eggs could bring a higher price on the market in these days, when the people are buying only the choicest cuts of meat and the fanciest packages of prepared foods. There is no good reason why guaranteed eggs should not bring as high a price as guaranteed food of any kind. And Professor Lippincott proposed that Kansas should take the initial step in showing the country how to distinguish between eggs that are eggs, and eggs that are suspiciously something else. He enclosed with these letters postcard acceptances, to which it was necessary only to sign the name. These postcards explicitly explained that the instruction to the egg buyer was to be absolutely free of charge and that a half day's special instruction was to be given each individual. The school was officially termed "Merchants' Egg Candling School" and arrangements were made for its sessions, usually in the office or warerooms of the largest egg dealer of the city. The first egg candling school, held at Wichita, was attended by forty-seven egg buyers.

FIRST EGG CANDLING SCHOOL IN THE COUNTRY.
Held at Wichita, Kansas, with forty-seven egg buyers in attendance.

Professor Lippincott estimates that the farmer who produces eggs which stand a strict candling inspection will be able to get three cents a dozen more than the farmer whose eggs prove to be merely "seconds" under the candling test. Inasmuch as Kansas produces something like eighty million dozen eggs each year it can readily be seen that if Kansas farmers follow Professor Lippincott's advice they will be two and one-half million dollars better off at the end of

each year. And as the egg production of the United States for an average year reaches the immense total, in round numbers, of 1,300,000,000 dozen, it is not hard to figure up the additional increase to the farmer for producing "firsts" instead of "seconds," an increase of something like forty million dollars. Nor will this immense total work a hardship on the individual egg eater nor so appreciably add to the present high cost of living as to be the last straw to break the proverbial camel's back. The 1900 census showed the egg yield to be seventeen dozen per capita per annum. Who is there among us who would not pay fifty cents a year for the guarantee that every egg (whether masquerading in an omelet or boldly admitting its identity in an undisguised form) which we eat in the 365 days of a year is strictly fresh? Such a person, no doubt, it would be rather difficult to find.



FINE FOWLS, BUT THEIR DAILY LAY SHOULD BE MARKETED AT ONCE IF THE CONSUMER IS TO GET THE BENEFIT OF THE ORIGINAL QUALITY.

One beats the bush and another catcheth the bird.

Those who wish to appear wise among fools, among the wise seem foolish.

AT LAST THE CANCER PARASITE

By

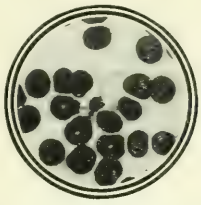
LEONARD KEENE HIRSHBERG, M.D.

When it was announced from France recently that cancer has its origin in a microbe, just discovered, the scientific world was both startled and incredulous. As bacteriologists of other lands have so far failed to isolate such a germ, final acceptance has been stayed awaiting absolute proofs. However, Dr. Gaston Odin, the discoverer of the new germ, *Haemamoeba neoformans*, as it is called, promises that the complete proofs shall be forthcoming in due time. The reader should bear this foreword in mind.—The Editors.

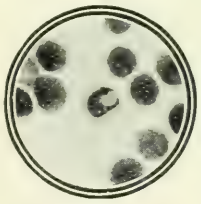
DR. GASTON ODIN of Paris, France, one of the younger laboratory scientists, who studies, experiments, and investigates the blood, tissues and germs of man and the lower animals, is said to have at last discovered the cause of the most fatal of chronic maladies—cancer.

Cancer is a generalized disease, which may break out in a number of places. Hence its origin must be sought in the blood. On placing a specimen of the blood of a cancerous person under a microscope, Dr. Gaston Odin noticed that many of the red corpuscles which are the most important constituent of the vital fluid were of an unusual form, somewhat resembling a horse chestnut instead of the smooth sphere which is the ordinary shape. Some of these were attached to normal corpuscles, but most of them floated free in the serum—the clear fluid which is the carrying medium of red and white corpuscles. It was only after long reflection on these curiously shaped forms that the true solution flashed across the mind of the French savant: that the cancer microbe had escaped detection hitherto because it conceals itself within the red corpuscles.

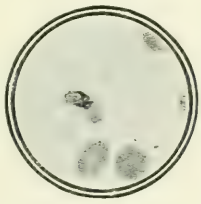
Assuming for the time being that this was the actual state of affairs, he endeavored to hit upon the means of forcing the microbe to reveal its existence by emerging from its hiding place. Since mechanical means are out of the question in dealing with objects one three-thousandth of an inch across it seemed that the most likely way to achieve this end would be a chemical preparation which would irritate or excite the micro-organism to the extent of forcing it to break the envelope in which it had surrounded itself. A long series of experiments followed, at the end of which a substance which produced the desired effect, was found.



ADULT CANCER PARASITE BEGINNING TRANSFORMATION.



INVADING THE RED BLOOD CELLS.



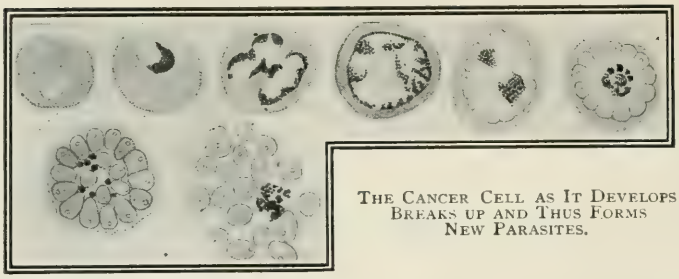
THE INVASION CONTINUES.

After he had mixed a drop of the reagent with a drop of cancerous blood on the microscopic slide, the number of normal red corpuscles seemed to have increased, while the chestnut-shaped bodies remained of the same number. At the end of a further few minutes the latter became greatly agitated, their former sluggish drifting motion being replaced by abrupt movements.

Later the organism had ceased developing, and had taken the forms which have since proved to be characteristic of the cancer microbe. These forms vary a good deal, the commonest shape being that of a flower with from four to seven petals. Some-

FIRST STAGES OF DR. ODIN'S CANCER PARASITE.

times one of the "petals" is longer than the rest, giving the appearance of a scarf-pin or racquet, a cross or a sword hilt; sometimes the microbe resembles a chrysanthemum, the thickly clustered petals being formed by very tiny filaments. A further and most curious shape is that of a letter H with branches of unequal length.



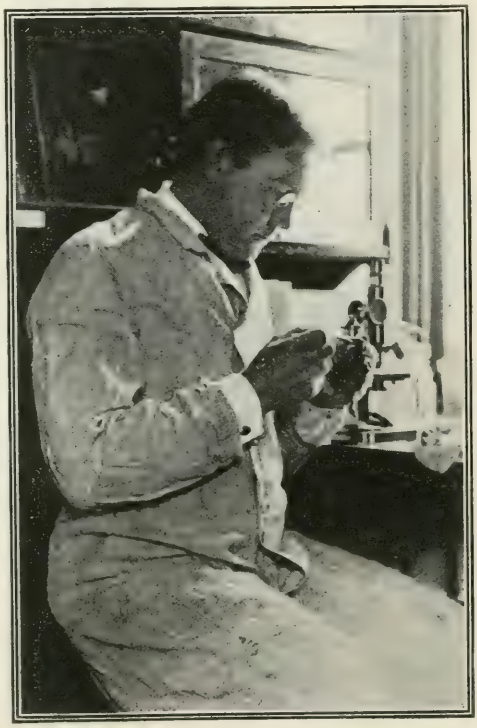
The Cancer Cell as It Develops Breaks up and Thus Forms New Parasites.

With these, the reagent reveals the presence of a number of spherical bodies with slender, waving filaments to the number of four, six, nine or fourteen. These bodies have a regular rolling motion, and somewhat resemble the microbe of malaria.

To the cancer microbe discovered by him, has been given the name of *Haemamoeba neoformans*—that is to say, a blood parasite which takes new forms.

Soon after this discovery, in order to make certain of its validity, Dr. Odin resolved to make an exhaustive series of practical tests. The first step was to prove that the microbe was actually that of cancer, and not an accidental visitor which might be harbored by some patients, and not by others. If a single case of cancer, diagnosed as such by a competent specialist, failed to reveal *Haemamoeba neoformans* in the blood when treated by the reagent, the theory would break down. The doctor, therefore, collected a large number of samples of blood from the principal physicians and specialists of Paris to the number of seventy-nine, and examined them with the new test. In every case the microbe was present. Then he wished to see whether the organism existed in the blood of healthy persons. Out of twenty-nine cases the reagent failed, in spite of most attentive examination, to reveal its presence; in one case only, a man of seventy-two years, the blood contained a few examples of the organism.

Nothing could be more encouraging than these results. To be doubly sure of himself Dr. Odin also arranged with Professor Matruchot, of the Sorbonne, the following decisive test. Eight test tubes, five containing blood from cancerous patients and three containing that of healthy individuals, were prepared.

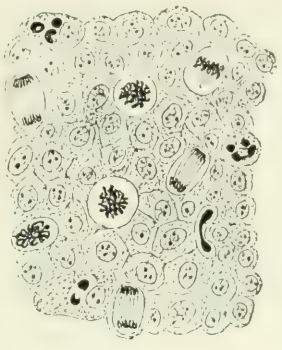


In the Laboratory—on the Trail of the Cancer Germ.

All of these tubes were numbered and accompanied by a sealed envelope containing particulars of their contents, the whole being placed in Professor Matruchot's hands. Dr. Odin then proceeded to his examination, and was at once able to recognize in every case by the reagent whether the blood was from a cancerous person or not. A similar experiment was made shortly after, at the Ecole Normale Su-

perieure, and again the results were absolutely accurate. Professor Matruchot, who himself examined the blood samples through the microscope was perfectly satisfied with the reality of the discovery and is full of enthusiasm for its future.

As to the exact nature of the reagent, Dr. Odin insists on keeping this a close secret for the moment. He is not yet at the end of his researches, and is naturally unwilling that the immensely important work which still remains for him to do should be forestalled by other laboratory workers, thus depriving him of the privilege of pioneer which he has earned. The disclosure of the formula he is reserving for future publication, when he intends to bring forward a mass of evidence and observations on the second stage of his work—the serum which he claims he has discovered for the cure of cancer, and which he is now perfecting and testing daily.



CANCER PARASITE—MAGNIFIED—DIVIDING AND MULTIPLYING.

Dr. Gaston Odin is endowed with a character more often seen among scientists than among any other class. His eye tells of a man used to overcoming obstacles, and it is probable that he will not stop at the point which he has now reached. Formerly a schoolmaster, he resolved, after accomplishing his military service at the age of twenty-two, to enter the ranks of science, and in a few years quickly became a doctor of medicine. He began his career in 1902, with the discovery of the origin of yeast, a problem which scientists have been studying since 1837 and which Pasteur sought to solve without success for thirty-five years. This discovery, which has also proved of great importance in brewing, was communicated to the Academy of Sciences in September, 1902.

IF it is good to use attention tomorrow, how much better is it to do so today. If tomorrow it is in your interest to attend, how much more is it today, that you may be able to do so tomorrow also, and may not defer it again to the third day.—*Epictetus.*

PICKING BERRIES PROPERLY.
Under the regulations of the Ozark association the stems of berries must be pinched off, and the berries must be placed carefully in the box—not thrown or dropped.

FIGHTING THE MIDDLEMAN

By

C. M. MORRISON

IT was a hot morning in the last week of May, 1912. Over a territory four hundred miles long and two hundred miles wide in southern Missouri and northern Arkansas, strawberries were reddening in ten thousand fields. Twenty-five strawberry buyers crowded the little office of P. A. Rodgers, general manager of the Ozark Fruit Growers' Association at Monett, Missouri. They wanted carloads of berries at their own figures. Rodgers had fixed his prices. He listened to their offers and shook his head:

"No use gentlemen" he announced as he turned to his insistent telephone, "not a car moves from this territory today except at the figures I have quoted."

Back to the Martin House tramped twenty-five disgusted buyers. They got together and compared figures. It was easy to see that this would be the Big Day of the 1912 strawberry season.

"Rodgers is holding us up," said one, "and this is the day to break these Association prices. Hold off everybody and we'll pull these prices back where they ought to be."

"We're with you," chorused the buyers.

Rodgers over in his offices was in consultation with his trusted lieutenant, Secretary J. W. Stroud. The situation was ticklish. By dusk, fifty cars would be loaded and ready to leave for the markets. Every minute some grower was

telephoning from Sarcoxie, Van Buren, Logan or Pierce City, giving notice of a car ready for movement.

"We might as well test our strength now as later," decided Rodgers. A sheaf of telegrams was sent to the Association agents watching the markets in St. Paul, Detroit, Denver, Kansas City and other northern and western towns.

"Watch markets closely," ran these messages, "Book orders only at prices quoted."

The morning dragged. It was afternoon when the buyers came back from the hotel. They were getting worried and insistent. They argued and Rodgers listened. It was an old story to him.

"Good heavens man," shouted a Chicago buyer, "this thing is robbery. Your berries will rot in the cars. We will give you $1.25 a crate. Not a cent more."

Rodgers came back with his quoted prices of $1.50 a crate. Both sides were firm at 3 o'clock. Cars were piling up. Pickers would be busy till dark. At 4 o'clock a buyer offered $1.35 but Rodgers shook his head. He was fighting for the Ozark idea and the interests of nearly 5,000 fruit growers. The buyers went into another caucus at the hotel.

Then something happened. The wires woke up. The Ozark agent in Denver ordered five cars and the man in the Twin Cities doubled that order. These were followed by sales of eight cars in Kansas City, seven in Milwaukee and Chicago took nine more. In forty minutes more than two-thirds of the berries were sold. Then the buyers capitulated, glad to get what was left. They were fighting an organization with expert and comprehensive market knowledge. The Ozark had won its 1912 battle.

This Association stands between the fruit grower and the commission man. Within the last eight years it has become the most powerful force in Mississippi valley fruit marketing. It takes the big and the little grower under its protection and sees that he gets a fair price for his product. It puts in his pockets much of the profit that the dealer has always taken.

In 1912, thirty-five local associations affiliated with the Ozark. Nearly 5,000 strawberry and fruit growers are members. It covers the vast territory from Van Buren, Ark., north to Koshkoning, Mo., and thence west to Seneca, near the Kansas-Missouri line. Every fruit district in the Ozarks is represented.

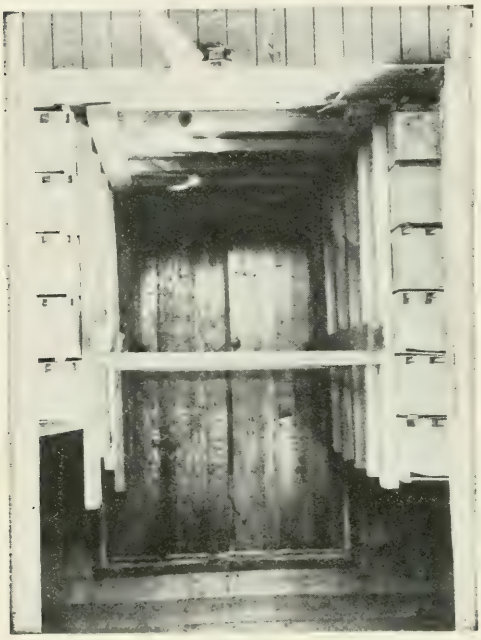
PACKING AND GRADING BERRIES.
Ozark regulations prohibit green, decaying and imperfect fruit. Boxes must be well filled, uniform in quality and not trimmed on top with the best berries.

LINE OF WAGONS WAITING TO UNLOAD.

The idea is twenty years old. Two decades ago Ozark fruit men vaguely sensed the need of a co-operative selling agency. Railroad companies were robbing them, commission men were taking all the profits and their pickers were holding them up. They

started organizing blindly and these were troubled, jealous and bitter years. Finally the better informed growers met at Springfield, Mo., early in 1904 and formulated a plan. Two months later the Association was incorporated under the laws of Missouri. That year they handled the strawberry crop successfully. Next year the volume of business leaped upward. More members joined. The growers were jubilant. At last they were able to sell their fruit for what it was worth. This year the peach crop was handled entirely by the Association. They have sold apples, canteloupes and berries for several years.

It is really an exchange. Here is the working plan. You can join a local association that is already affiliated or you may join as an individual. Any grower becomes a member on subscribing for $1.00 in stock. At the annual meetings a staff of officers are chosen by delegates from the local bodies. Agents are selected to look after Ozark interests in a dozen big



A Scientifically Loaded Car.
Much space is left between the crates. They must not be piled high. Each car is braced with heavy timbers.

SKILLED PACKERS SET THE STANDARD FOR HANDLING THE PEACH AND OTHER FRUIT CROPS.

cities and inspectors, graders and a main office staff are chosen. A fee of two per cent on gross sales is charged. When this sum proves insufficient to pay the running expenses a small assessment is levied on the membership. Usually there is a surplus.

Here are a few of the many benefits to the grower. It informs him as to the markets and guides him as to the acreage he will plant. It fights his battles with the transportation companies and sees that he is not robbed by the buyers. Trained men sell his berries in the biggest markets and fruit experts show him how to raise big berries and quality peaches. Inspectors who know their business show him how his berries must be picked, graded and packed. He makes a contract with the Association in which he agrees to sell all his output through its agents.

The Ozark is at the elbow of the grower. It watches him pick his berries. An inspector knocks the top off every crate and looks for stemless, trashy, green and over-ripe fruit. When it is rejected the owner must dispose of it through other channels. No bad fruit passes through its hands.

It has helped solve the picking problem. The Association fixes the price that shall be paid to all pickers. This has kept down sporadic strikes, prevented delays and anticipated losses. In 1912 berry pickers all over Association territory were paid one and one-half cents per wine quart. These things are covered in the regulations issued yearly by the Ozark. Growers are asked to gather all berries in the early morning, the stems must be pinched off from one-half to three-quarters of an inch from the berry and they must be placed in the box carefully, not thrown or dropped lest they be bruised. Field bosses see that these rules are enforced as nearly as possible.

Growers are encouraged to use members of their own families in picking the crop. The fields are full of women and children in berry time. They help in the packing sheds, doing all their work under the eyes of trained fruit men. When the berries and peaches reach the station another Ozark inspector looks them over and sees that the cars are properly loaded. The crates are carefully placed and braced in every car shipped by the Ozark and the losses have been reduced to a minimum. Inspectors meet every one of the long lines of wagons and every car is sealed by an Ozark representative.

In 1912, the Ozark plan put $1,000,000 worth of fruit on the markets. The price of the strawberries sold averaged approximately $1.50 a crate. In 1904, the best that could be done was ninety cents per crate for the year's shipments. The Association has been worth immense sums to the growers.

"In 1905," says Manager Rodgers's report, "we averaged $1.10, a gain of 20 cents. In 1906 we handled 666 cars at a general average of $1.32 a crate. We did not operate in Arkansas in 1907 but our Missouri berries averaged $2.13 a crate. Berries were of poor quality the next season but we averaged $1.80. In 1909 our average was $1.93. In 1910 we got $2.31 and in 1911 we averaged $2.12."

The Ozark keeps in touch with the markets. It sells berries in far away Winnipeg, Billings and east as far as Buffalo. The commission man can no longer wire, "Car badly damaged, fruit poor, cannot use except at reduction." When this happens there is an Ozark agent there within a few hours to look into the matter. The crooked dealer cannot do business with the Ozark.

The Ozark plan affects the consumer in the end. The Association is showing the growers how to grow wonderful berries and peaches. These are grown, packed and shipped as they should be. The consumer gets better fruit for his money. In service to the grower and consumer there is but one organization in the country that compares with it—The California Fruit Exchange.

"We want our parts of the profits," says Col. J. W. Torrey, famous fruit grower of Brandsville. "The middleman has robbed us for years and we would be helpless without this co-operation."

"We want the buyers to make a reasonable profit," says Secretary J. W. Stroud. "but if there is a rise in the market we believe the grower should profit as well as the buyer."

He does under the Ozark plan.

REMARKABLE EQUESTRIAN STATUE

THIS statue of Peter the Great in St. Petersburg is noted as one of the remarkable equestrian statues of the world, for the reason that there is no support to it excepting the rear feet and tail. The pedestal is a huge rock, forty-two feet long, eleven feet broad and seventeen feet high. This huge rock, which is said to weigh fifteen hundred tons, was found in a marshy forest some distance away. Catherine II built a road several miles long, over which the rock was rolled on friction balls by means of pulleys and windlasses, and was then conveyed by a float to the landing place on the Neva near its destined location.

THIS STATUE IS SUPPORTED ONLY BY THE ANIMAL'S HIND LEGS AND TAIL.

Inasmuch as the only paraphernalia that is required for the work is a chair for the patron, a bit of soap, a mug and a razor, it would seem as if it would be possible for the poorest individual to start up in business for himself. However, the outdoor membership of the profession does not seem to be overcrowded for it is stated that often the patrons form in a line awaiting their turn.

It is to be feared, however, that the customer has but little opportunity of having his face properly washed after the operation, or that the towel can be very clean. Doubtless the whole business would seem very shocking to those in our own land who insist that some attempt, at least, be made to conform to sanitary rules.

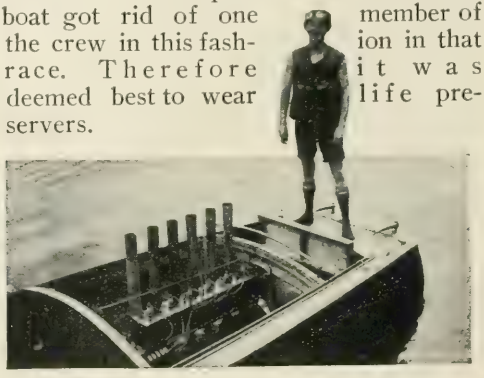
AN OUTDOOR BARBER SHOP

HERE is outdoor life with a vengeance. Itinerant peddlers, musicians, and whatnot are, of course, frequent sights in foreign cities, but it remains for Rouen, France, to produce the open air, or the "open shop" barber. The patrons of this sort of barbers are mostly members of the crews of vessels.

WHERE BARBERS SHAVE OUT OF DOORS.

COSTUME OF MOTOR BOAT FIEND

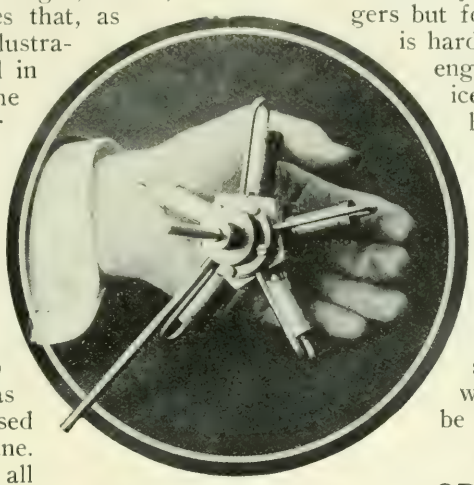
THIS is Al. Smith, the youngster who helped pilot the new speed boat *Al. Parnel Jr.* in winning the speedboat championship of the Delaware River recently. These fast boats frequently in their bucking, frenzied career around the racing courses throw their crews into the water. This particular boat got rid of one member of the crew in this fashion in that race. Therefore it was deemed best to wear life preservers.



SAFE COSTUME FOR A MOTOR BOAT FIEND.

TINY AEROPLANE ENGINE

IN France, where they are so sedulously striving to perfect the art of flying, exact models of flying machines and their engines are constructed occasionally on a very small scale. So slight, indeed, are some of these engines that, as may be seen in the illustration, they can be held in the open palm of the hand. The tiny motor herewith shown is a five cylinder Gnome motor. It is constructed for practical purposes and not merely as a curiosity or to show how skillful one may be in working in metal on so small a scale. It was built to be actually used in a miniature aeroplane. In this little model, all five cylinders are coupled so that the movement of their shaft is transmitted to their main shaft, which holds the propeller.



ENGINE FITS INTO THE HAND.

The builder of this little engine, when he had properly installed it in his equally tiny monoplane, set the apparatus in action, and the aircraft sailed about the room slowly, bumping into the walls and projecting pieces of laboratory apparatus as if it were some huge insect that was trying to find an exit.

This miniature model could hardly be considered a toy, though no doubt it would be largely welcomed by the enterprising youngster of today, if it were given him as one of his possessions.

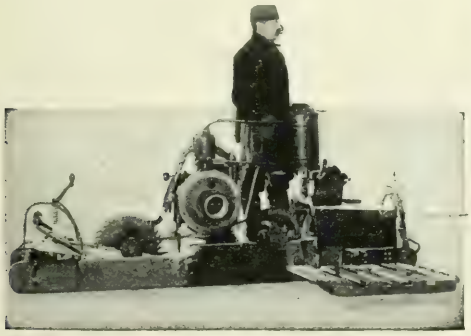
MOTOR THAT CUTS ICE

THIS peculiar motor is equipped with a platform on which can be carried four to six persons and also the chauffeur. The motor, which is a Norwegian device, is not only for carrying passengers but for cutting ice. There is hardly a plant in Norway engaged in the storing of ice, so that this invention has met with popular approval. In the rear of the machine there is a wheel, equipped with sharp teeth, which resembles a saw. When sunk into the ground by a controlling device, the saw will cut. In this way blocks of ice may be cut.

ODD SEAT FOR WAYFARERS

A MILLSTONE that had been discarded from Sheldon's mill at South Devore, N. Y., lay on the ground for many years. A seed, blown about by the wind, dropped into the core of the stone; it grew into a tree finally, filling the hole in the center of the stone. As the tree grew the stone was lifted from the earth, as shown in the picture.

Thus nature turned to an unexpected use the handwork of man.



THIS MOTOR WILL CUT ICE.

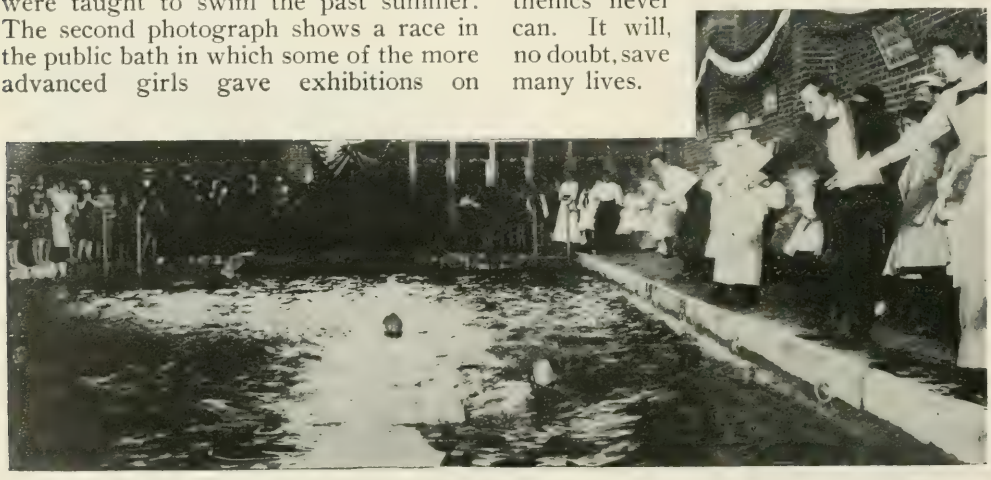
STONE SEAT ELEVATED WITH TREE'S GROWTH.

GIRLS ABOUT TO START IN A SWIMMING RACE.

PHILADELPHIA GIRLS TAUGHT TO SWIM

PHILADELPHIA'S board of education has had teachers engaged making swimmers of all the little girls who attend the public baths. It is almost a rarity now to find a girl who cannot swim. Many are becoming expert. One little kiddie although only seven years of age swam easily the length of the pool. All the girls in the first of the pictures were taught to swim the past summer. The second photograph shows a race in the public bath in which some of the more advanced girls gave exhibitions on Thursday to admiring relatives. The race in the picture is the taper race. Each girl is carrying a lighted taper in her mouth. If the taper goes out she has to swim back to the starting point and have it relighted.

Here at last in gymnastic work the public schools are doing something of which all can approve. Swimming is an ideal exercise—one that truly develops and strengthens as perfunctorily performed calisthenics never can. It will, no doubt, save many lives.



A CONTEST IN THE TANK.

A MOST DANGEROUS OCCUPATION—MANUFACTURING WHITE LEAD.
Mouth and nose have to be protected against the poisonous fumes.

UNKNOWN HEROES OF INDUSTRY

By

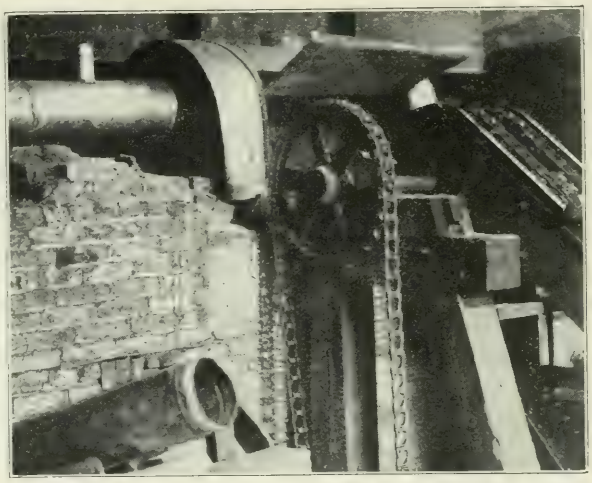
HUGH C. WEIR

THREE attic rooms, acid-smelling and heated to a close, oppressive temperature, shelter the operations of a certain obscure felt hat manufacturer of South Chicago. At monthly intervals a dray-load of cases from a New York jobbing house brings him the raw material from which he makes soft hats for a wholesale men's clothing store. The raw material consists of the rough, uncombed hair of hares from Russia, South France, Germany, and occasionally Persia. From this stock of animal hair, his modest working force—twelve men and three girls—produce first long, damp layers of felt, and then the sober or jauntily turned creations of masculine head-gear.

A humble, uninteresting business—apparently. A typical tenement section employment, the casual observer would shrug. And yet up the four flights of dark, narrow stairs, and through the door before which creaks the dusty sign, "John Williams, Felt Hat Maker," you will find one of the most dangerous of modern day occupations. It has nothing of romance or glamor about it, this daily, monotonous toil of the bent-shouldered, sallow-featured group of men at the lines of simple machinery. And even after you have followed the details of their work—from the angle of the layman—it is possible that you would fail to find the element of hazard. But in the digest of the Illinois state factory department—a bureau which has made one of the most thorough industrial studies in the history of this country—occupational injuries

and deaths of the felt-workers are red-underscored.

Let us glance at the different features of the process by which the hair of a rabbit, caught in a Russian field, is transformed into a stylishly turned felt hat in a South Chicago attic. No magic wand is employed—or even intricate machinery. From the packing case in which it arrives, the hair is dumped into a square box, attached to a revolving wheel and given a vigorous shaking, which removes any foreign particles in the matted substance. Incidentally if you are a hay-fever or asthmatic sufferer, you will beat a precipitate retreat. From the agitated box pours a thick cloud of yellow dust, through which the faces of the workmen loom like the caricatures of a fog. It is not like ordinary dust, but is thicker, drier, and is filled with tiny hair-particles that sting like needle-points. Occasionally a sneeze will echo sharply through the room, but not often. The veteran felt-worker is used to the dust. His lips may compress, and he may dash a rough-sleeved arm over his eyes—but that is all. The dust-cloud is a part of the day's work.



Exhaust System for Removing Poisonous Gases in a White Lead Works.

By methods such as this the workers can at least be partially protected.

A second and longer box, containing a series of small, rotary wheels, next receives the hair, a well-directed air-current driving it in and under and over the various wheels until the longer strands are thoroughly separated from the shorter, fluffier ends that are classed as waste material. A metal cone, punctured by dozens of small holes, is now called into service, the air-current forcing the hair onto its surface, and the holes, of course, retaining it. The mechanical part of the felt-manufacture is over. Simple, almost crude, isn't it?

The dust-cloud by this time has somewhat settled. The workmen, who have been supervising the rotary wheels and shifting boxes now advance to the metal cones. The next step in the making of felt, the long, laborious process of kneading, is done by hand. Clinging to the surface of the cones, thin circular strips gradually take form, are worked by supple fingers—as long and supple as those of a professional pick-pocket—into the required degree of firmness, and then lowered carefully into basins of acid water. A peculiar, biting gas-vapor mingles with the remnants of the dust, for the acid-water is made from oxide of lead, acetate of copper salts and proto-sulphate of iron—deadly poisons, even to the fumes if inhaled long enough. The chances are that you will stagger to the outer air, suddenly conscious of a strange, nauseating faintness. The felt workers, however, stick to their posts with a shrug. Like the dust-clouds, the gas-vapor is a part of the day's work.

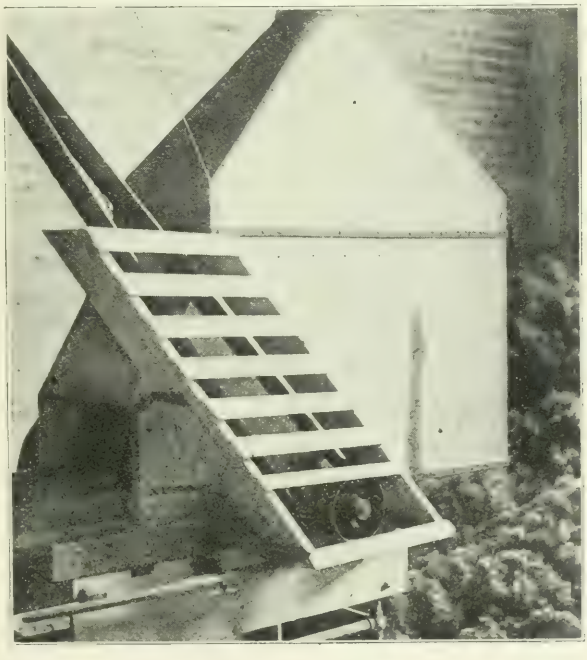
To and fro in the poison-water, they wash the layers of felt, shaking them up and down like a laundress rinsing a dainty fabric. You can see now, if you haven't observed the fact before, that their hands are criss-crossed by angry, purple seams and in some cases their palms split in half a dozen places. The acid eats into flesh with cruel force.

From the vapor-rinsing, the felt is seized by heavy rollers and pressed dry. The layman might think now the labor is done, but the operations of dyeing and shaping are yet to be performed before

the material is ready for the hat-blocks. This means hours of patient sandpaper polishing—and more of the dust-clouds, although this time, they are finer, and if possible, more irritating than before—and finally another rinsing in other deep basins. By any chance should you thrust a too-inquisitive nose over these last vessels, the probabilities are that you would be picked up unconscious, and very near death, for they contain methylated spirits, one of the quickest acting poison-generators known to science. Even the veteran workman approaches them with head thrust back and lips set tight, and as he releases his burden, springs back like a man before the open door of a white-hot blast furnace. The deadly spirit-dressing is the last step in felt-manufacture. The product is now ready for the hatter.

Are you beginning to view the obscure felt-worker from a new angle? Let's see—the Illinois state factory department enumerates four definite and vital dangers which he faces in his humble employment. First, of course, there is the menace of the constant dust-clouds, clogging the throat, filling the nostrils, seeping into the lungs. In the list of tubercular victims, the felt-worker ranks well to the front. It is conservatively estimated that one out of ten of American felt-workers is stricken with a fatal lung-disease, annually.

And then there is the poison danger, at least two distinct forms—mercurial and arsenical. Either may strike its victim down by slow, relentless stages, so slow that he does not realize his danger until too late for escape. And from poison the felt-worker is open to attack from three different directions. The vapor sweeping into his lungs, is obviously the most direct. An insignificant cut on the hand, a slight abrasion of the skin may afford the poison entrance to his blood, in a minute quantity, perhaps, but repeated day after day, week after week until suddenly fatal proportions are reached. Again tiny poison-particles may take unsuspected lodgment against the gums of the mouth, or perhaps under the finger-nails. The workman in a hurry to reach home and a warm meal, dashes away from the factory after a careless wash, and maybe with no wash at all, totally unconscious that the first morsel of food he thrusts into his mouth carries a poison-atom with it. Only an atom, but atoms have an uncomfortable habit of multiplying, when the product is—death.



The Curled Hair Picker in the Felt Hat Factory Is a Machine That Stirs up a Thick Cloud of Yellow Dust.

In a list of four hundred felt-workers, a recent medical investigator reported seventy-five in varying stages of mercurial or arsenical poisoning.

The fourth, and undoubtedly the deadliest danger of the felt-industry, it is quite safe to say that even the most careful observer, not familiar with the technical details of the trade, would fail to guess.

One afternoon, Fritz Steiner, a young German immigrant employed at the

felt-hat establishment of John Williams, reeled back from a kneading cone. His face was ghastly pale, and he staggered like a drunken man. Two of the workmen assisted him to an outer room, and a physician was summoned. When the doctor arrived, Steiner was vomiting profusely, his face was a dull brick-red, and his pulse was alarmingly slow and feeble. Thoroughly puzzled, the physician ordered him to a nearby hospital. It was there that a sore, almost like a boil, was noticed on his left wrist—a sore with a strange black center. One of the surgeons of the institution—a man who had made a specialty of little-known diseases—glanced up with a frown.

"He has anthrax!" he said curtly. "He may die in twelve hours, and he may live two days."

Twenty hours later Steiner was dead. Three days before he had been in a normal physical condition—a young giant with a constitution apparently of steel.

You have never heard of anthrax? The fact is not strange. The average physician would probably hesitate before venturing to describe it. In a bald sentence, it is a skin-and-blood poisoning, communicated from animal to man.

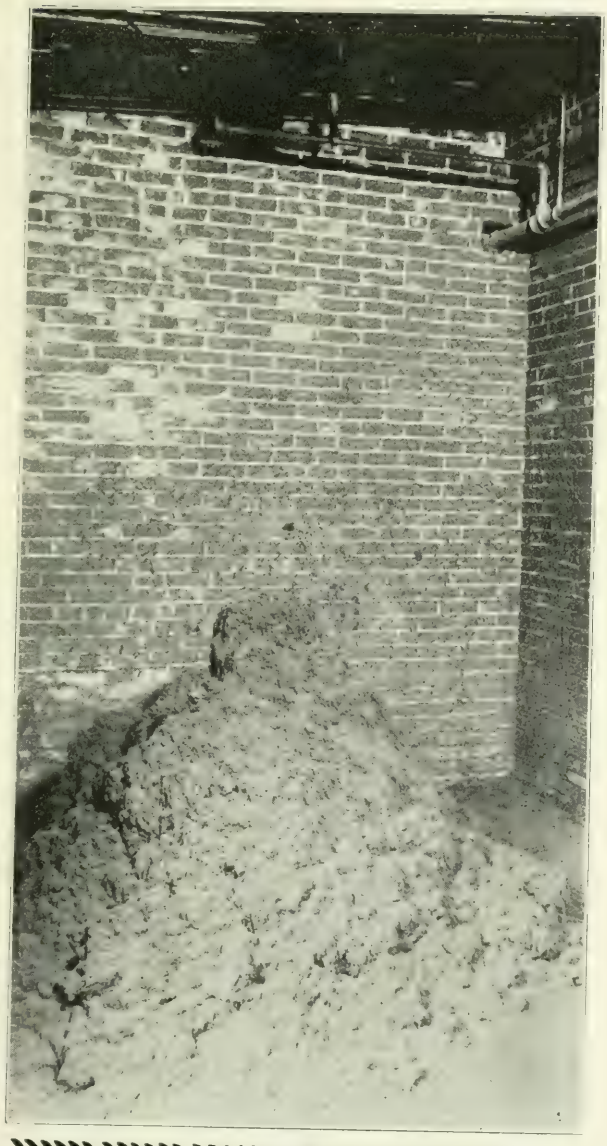
As a matter of fact, it is one of the few diseases—some authorities say the only disease—that can be transmitted in this fashion. Even a hundred and fifty years ago, there were records of a curious skin epidemic, acting with appalling swiftness among cows and sheep in England, and devastating entire farms. But that anthrax could be communicated to

DUST COLLECTING SYSTEM IN A MACHINE-SHOP POLISHING DEPARTMENT.
This plan saves the workers' lungs.

man is of comparatively recent discovery.

According to the medical diagnosis, a slight cut on Steiner's wrist had received poison germs, concealed in the hair from a diseased skin—germs that had at once continued their deadly work in human blood. The significant part of it is that the above incident is by no means uncommon. A British authority on animal ravages reports twenty-four fatal cases of anthrax in one year in England—not among animals but among men.

The number of infected pelts sold for industrial purposes is surprising, and unless the dealer goes to the expense and labor of a careful investigation, it is easily possible for the fact of disease to escape him. Perhaps the slaughtered animal has only just contracted the taint. It may be that it has not even appeared externally, but if it has worked its way to the surface in the most obscure form, the germ may strike any of the score of men handling the skin. It may be the butcher, or the tanner, or even the stevedore at the steamer. The ravages of anthrax have been mostly confined to foreign countries. It is very prevalent in Persia and Russian Tartary, for instance, and on more than one occasion has approached a national menace at these points.



This Heap of Dust Came out of the Collectors Shown on the Page Opposite.

Suppose we give the circle of our obscure occupations another turn. You can prepare yourself for more surprises. Snugly comfortable in your arm-chair, how little you know of American industries—how little it seems *necessary* for you to know!

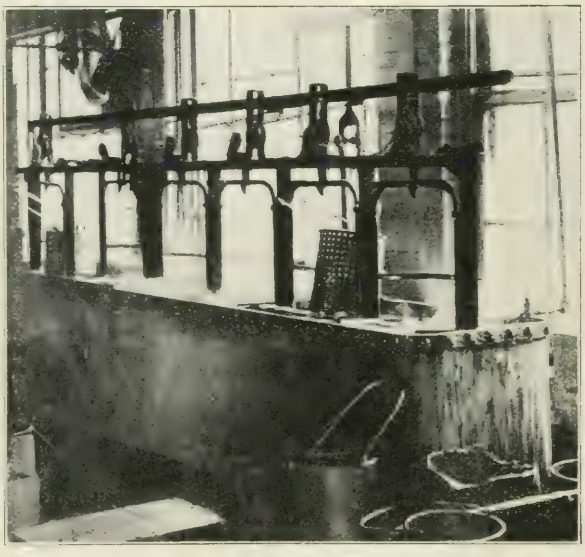
For example, the oil-cloth and linoleum-maker. Hazard here? You raise your eyebrows as your glance falls to the red-and-black-squared strips covering the floor of your store or office. Let me ask you if you know aught of how or where they were made? No—then let me give you a glimpse of a typical oil-cloth and linoleum factory.

We find huge sheets of canvas, tight-stretched on massive frames. This is where our oil-cloth or linoleum, no matter how expensive, has its beginning.

Workmen with buckets of paint are thickly smearing both sides of the surface. If you venture close enough to catch the fumes from the buckets, you will step hurriedly back, perhaps with your head whirling and a curious dizziness assailing you. The paint is made of a thick compound of litharge or acetate of lead—not only one of the most virulent poisons of itself, but pouring forth a sense-numbing odor as though in a dull anger at the waste of its destroying powers. The workmen, however, draw their brushes back and forth in its deadly contents with a stolid calm. The atmosphere of the poison, which is to turn the canvas into water-proof oil-cloth, is only another incident of the day's work.

Two coats of the lead varnish are applied, smearing every fraction of an inch. The vapors from the wet surface are so powerful that you spring instinctively toward the window and fresh air. Is it hard for you to realize now that anywhere from twenty to thirty per cent of the men in the oil-cloth industry suffer from some degree of lead poisoning? It may mean paralysis of the wrists, depriving the victim of the use of his hands; or it may mean the agony of chronic rheumatism; or a long-suffering kidney disease; or it may result in a hardening of the arteries, certain death in the end, but maybe not for years. Lead-poisoning does not kill quickly. That is the worst of it.

But we are not done with the oil-cloth factory. We have not yet entered the linoleum department. It is not enough to paint the canvas to make linoleum. It must be dipped in a powerful solution of linseed oil, rosin, and Kauri gum, mixed further with heated cement and fine-powdered cork, having the effect of increasing both its durability and water-proof qualities. You will recognize another poisonous compound here, although if you are not a chemist you will probably underestimate the fatal qualities of linseed oil, for instance. Also, it is quite likely that you will not associate such a solution with high explosives. The insurance inspectors, however, make no such mistake. Cork, of itself, is readily inflammable, and when added to the heated cement its qualities as a sharp, angry combustible are increased. It seems impossible to measure the point of danger, or to guard adequately against it. Explosions in the "mixing" room of a linoleum factory are more frequent even than in a dynamite depository. Dynamite, after all, is not so dangerous to a careful man as popular superstition fancies. On the other hand, the most elaborate safeguards seem to avail little in the handling of the cork-cement mixture of the linoleum-workers. Its destructive powers are not nearly so great as dynamite, of course, but a man with a hand or a leg torn off is not to see much reason for congratulation because the explosive was not sufficient to send him into eternity!



Large Potash Tank Equipped with Mechanical Dipping Device so That the Workers Will not Get Their Hands in the Solution.

Accurate statistics of accidents to linoleum makers are impossible to obtain. Perhaps it is because few of them are immediately fatal. It seems safe to assume, however, that, taking the country as a

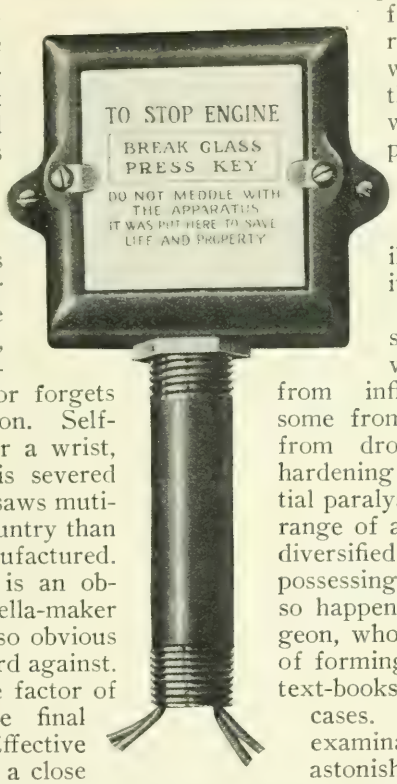
whole, one workman in ten is more or less seriously injured by explosions each year. Perhaps the proportion is higher. Certainly it is not lower. And yet how many of us have ever connected linoleum-makers with the handling of dangerous combustibles?

Take another apparently innocent necessity—the umbrella. "Umbrella-manufacture is a product of delicate machinery, and delicate machinery means dangerous machinery," says State Factory Inspector Edgar Davies, of Chicago. "It means swift-revolving circular saws, for instance, for the shaping of the handles, and a saw can do wonderful things, if the operator forgets himself in its manipulation. Self-oblivion until a finger, or a wrist, or the half of an arm is severed with the wood. Circular saws mutilate more limbs in this country than all of the revolvers manufactured.

"Machinery, however, is an obvious danger. The umbrella-maker faces other menaces not so obvious—and even harder to guard against. For example, there is the factor of sand-paper dust in the final polishing of the wood. Effective use of sand-paper means a close concentration of every faculty—eyes glued to the task, face bent low over the bench, mouth and nostrils buried in a cloud of fine dust and drawing it into the system with every breath.

"In one umbrella-factory, employing a hundred men," he continued, "a medical examination may reveal fifty suffering from some form of acute bronchitis tuberculosis, or fibroid tissue.

"After the polishing of the umbrella-handle comes the process of varnishing—varnishing in a solution of shellac, naphtha spirits, and red or white lead, with the workman breathing the dangerous fumes steadily as he puts the finishing touches to the product. It is not until the umbrella is packed for shipment that the gamut of hazards in its making is ended."



IF A WORKER GETS CAUGHT IN MACHINERY.
A device that will save many lives.

It is a curious fact that dust-dangers of industry have only been appreciated within recent years. Indeed it has only been in the last four or five years that anything like a systematic, scientific study of the subject has been attempted. And this in spite of the fact that alert factory superintendents realized that something was radically wrong—that a mysterious menace was threatening their employers. Take the Pullman Car Company of Chicago. In one month eighty cases of severe illness were reported in its repair department.

Medical examination showed that some of the victims were suffering from inflammatory rheumatism, some from Bright's disease, some from dropsy. In certain cases, hardening of the arteries and partial paralysis were detected. A wide range of ailments, apparently from diversified causes, and seemingly possessing nothing in common. It so happened, however, that a surgeon, who had developed the habit of forming opinions not in medical text-books, was called into the cases. When he had finished his examination, his diagnosis was astonishing.

"These men are all suffering from the same complaint!" he announced flatly.

The company's superintendent stared.

"Impossible!" he protested. "Rheumatism, Bright's disease, dropsy, paralysis—certainly they have nothing in common!"

"They do in these cases!" was the curt rejoinder. "Lead-poisoning!"

The surgeon made an alert-eyed inspection through the shops, with the amazed superintendent at his shoulders. In the repair department, he stepped into a row of cars, undergoing re-varnishing and re-decorating. A line of men with dull knives and sand-paper polishers were removing the old paint, preparatory to a new coat. Around them hung a cloud of dust so thick that the surgeon

sprang back to the door, sneezing frantically. But a gleam of satisfaction had flashed into his eyes.

"There you have the explanation of the mystery!" he announced. "That dust is impregnated with hundreds of grains of lead-poison. If those men stick to their jobs long enough, I wouldn't give a dollar for their lives!"

The census gives us thirty-five million wage-earners in this country, exceeding the mature age of fifteen years. Of these, at least forty per cent are stricken annually by occupational accident or sickness. It is true that the attending physician may diagnose the disease in any one of a dozen different forms, none of them apparently connected with the employment of the victim. But then the average physician knows only the diseases of the text-books—and the causes and remedies assigned by the text-books. He would probably give a well-bred shrug at the suggestion of connecting Bright's disease with lead-poisoning, or acute rheumatism with arsenical poisoning, or a weak heart with phosphoric poisoning, or tuberculosis with sand-paper dust, or the ravages of sudden fever with anthrax.

And what of the staggering loss in dollars and cents, measured by these stricken millions of our industries? One expert, on the basis of an average daily wage of $1.50 and an average absence from work of three weeks in the year, estimates a loss to the workmen of twenty-one million dollars. This, of course, does not compute the expense of physicians, medicines, nurses—nor on the other hand, either the loss to the employer, or in a broader sense, the economic loss to the country.

Of course, a very great proportion of these facts are unavoidable. Absolutely safe machinery, thoroughly hygienic working conditions will never be achieved. Industry will always claim its human toil. The underscored emphasis in it all, however, the detail which stands out with head-and-shoulder conspicuousness is the proven statement that at least one-fourth of our occupational diseases and accidents are preventable—not only preventable, but *criminal* if not prevented.

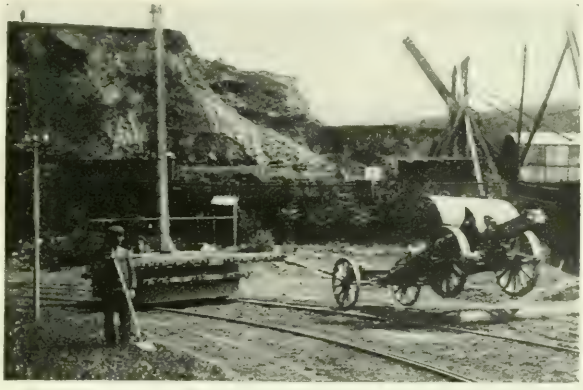
And the means of prevention are often absurdly simple. The vigorous use of a tooth-brush, for instance, at the close of the day's work by those men working in a poison atmosphere. An orange stick or a steel file for the cleansing of the finger-nails. The trouble is that in most cases, the felt-worker or the linoleum maker or the Pullman car repairer has not been educated up to the tooth brushes and manicure appliances—or dismisses them with a laugh as effeminate.

Apart from the individual safeguards of the workmen, however, are the broader responsibilities of the factory. Respirators, for example, in dust-clouds and poison-vapors. Thorough sanitary regulations, proper bathing facilities, machinery shields, and above all, not merely the installation of such equipment but the enforcement of its use. It is not enough to spend a thousand dollars to safeguard human life—one Illinois factory recently spent twenty thousand dollars. Insistence on the use of that safeguard is as important as the safeguard itself.

"The average manufacturer doesn't want his factory to be made into a slaughter house," said Mr. Davies. "He is as eager to co-operate with us as we are to co-operate with him. The trouble is that he hasn't been shown what to do, and how to do it. That is our business—safety engineers. The time will come when every state will have them, must have them."

"ELECTRIC HIGH SPEED CAR"

ON a circular track laid out at the Krupp works in Germany, an electric car is used to take field guns and ammunition wagons around the track at high speed, so as to put them through a severe test. This sort of test is far more thorough than could be obtained by using teams of horses on the road. The new electric car has two 65-horsepower electric motors. On the top of its platform is an upright pole which cross-connects by a light iron arm to a pivoted pole at the center of the track. This allows the controlling to be done from a cabin mounted at the center. The current goes over the cross arm and to the motors. Above the cabin is an observation room for the officials or engineers, and the motorman in the cabin can also follow all the movements of the car.



CIRCULAR TRACK FOR TESTING GUN CARRIAGES.

In order to test the cannon on all kinds of roadways, different parts of the circular track are laid out to represent stone paving or smooth or rough roads such as would be usually found. To give a very rough jar to the wheeled trucks, obstacles such as logs are laid across, or ditches are dug in some places. The trucks usually come out victorious after this hard treatment, but if not any weak points can be corrected.

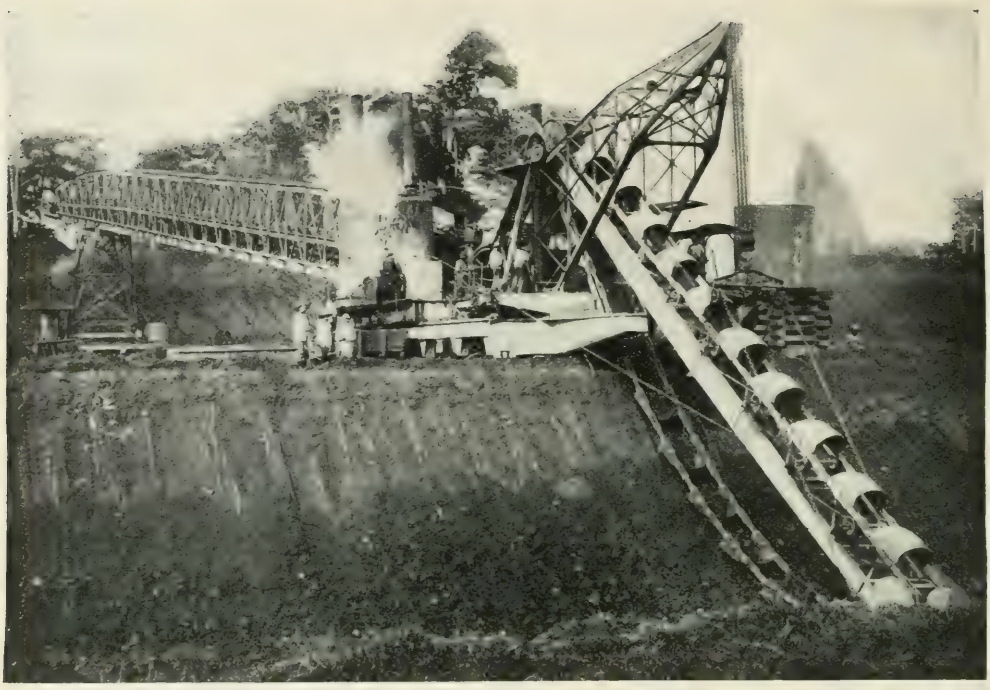
DARING CONCRETE STRUCTURE

A STRUCTURE of startling design is at present on exhibition at the Exposition of Trade, Industry and Agriculture at Köslin, Pommerania. This peculiar building, as seen from the accompanying figure, is a staircase freely projecting from the floor and is made entirely of iron-armored concrete. The upper landing of the staircase is designed as a pavilion from which a splendid view is enjoyed of the whole exposition grounds. This pavilion has a massive roof resting on four pillars and in conjunction with the staircase itself produces the most pleasing effects. Invisible lamps surround it every night with a dazzling flood of light.

The structure is about thirty-six feet high and has as a foundation an iron concrete slab from which two parallel flights of stairs of fifteen steps each rise at an angle of about forty-five degrees to a height of ten feet, where an iron concrete slab projecting for five feet connects the two stairs and forms a landing. From this landing there appears between the two lower stairs, another flight of stairs, rising—likewise at an angle of about forty-five degrees in twenty steps to a height of twenty-four feet.

The daring and startling feature of this structure is not only because of the fact that the flights of stairs grow out of the ground without any support, the extremely graceful outlines of the stairs and especially the landing are particularly amazing.

HELD UP BY CONCRETE'S STRENGTH.



THE SORT OF MACHINERY THE FRENCH USED AT PANAMA.

MACHINERY ABANDONED AT PANAMA

THE French constructors of the Panama canal wasted millions of dollars in expensive, intricate, machinery for excavation purposes before they went bankrupt and gave up the enormous task that cost them much money and many lives. All of the machines left by the French were well constructed of the very best material, but practically none of their elaborate plans and contrivances for excavation proved successful. The American engineers have found that the steam shovel is the best digger of the big ditch that it is possible to find.

MIDDAY REST IN A SCHOOL FOR DEFECTIVE CHILDREN.

IS SLEEP ALWAYS WELCOME?

THIS scene shows the noonday slumber hour of the children in a school in Berlin for backward or defective youngsters. Those children whose parents are obliged to be away from home at this time of day may get their lunch at school, then sleep for the refreshing period of an hour and a half. It would be rather interesting to know by what persuasive system the teacher was able to get all these youngsters safely locked in the arms of Morpheus, for any one who has had charge of even one child will know the difficulty of inducing him to rest when his senses and inclination often call for play. The little chap on the steps, indeed, seems not to have yielded to the gentle call of sleep with his comrades. He can probably answer the question, Is sleep always welcome? to his own satisfaction.

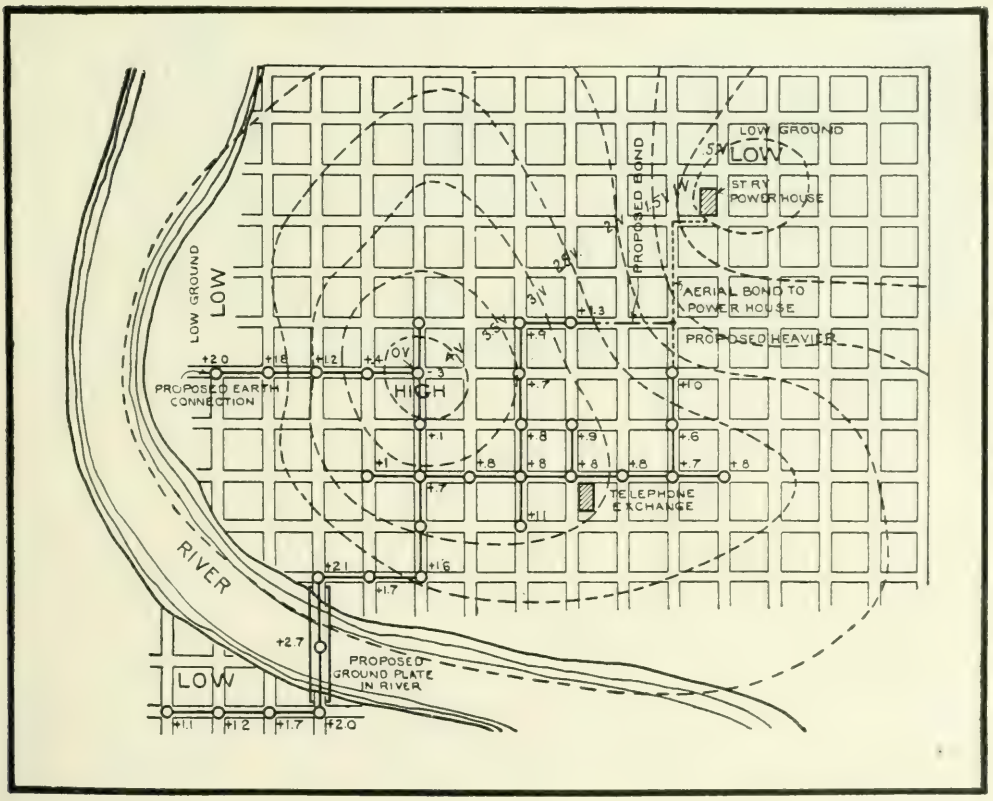
ARRESTING VAGRANT ELECTRICITY

By

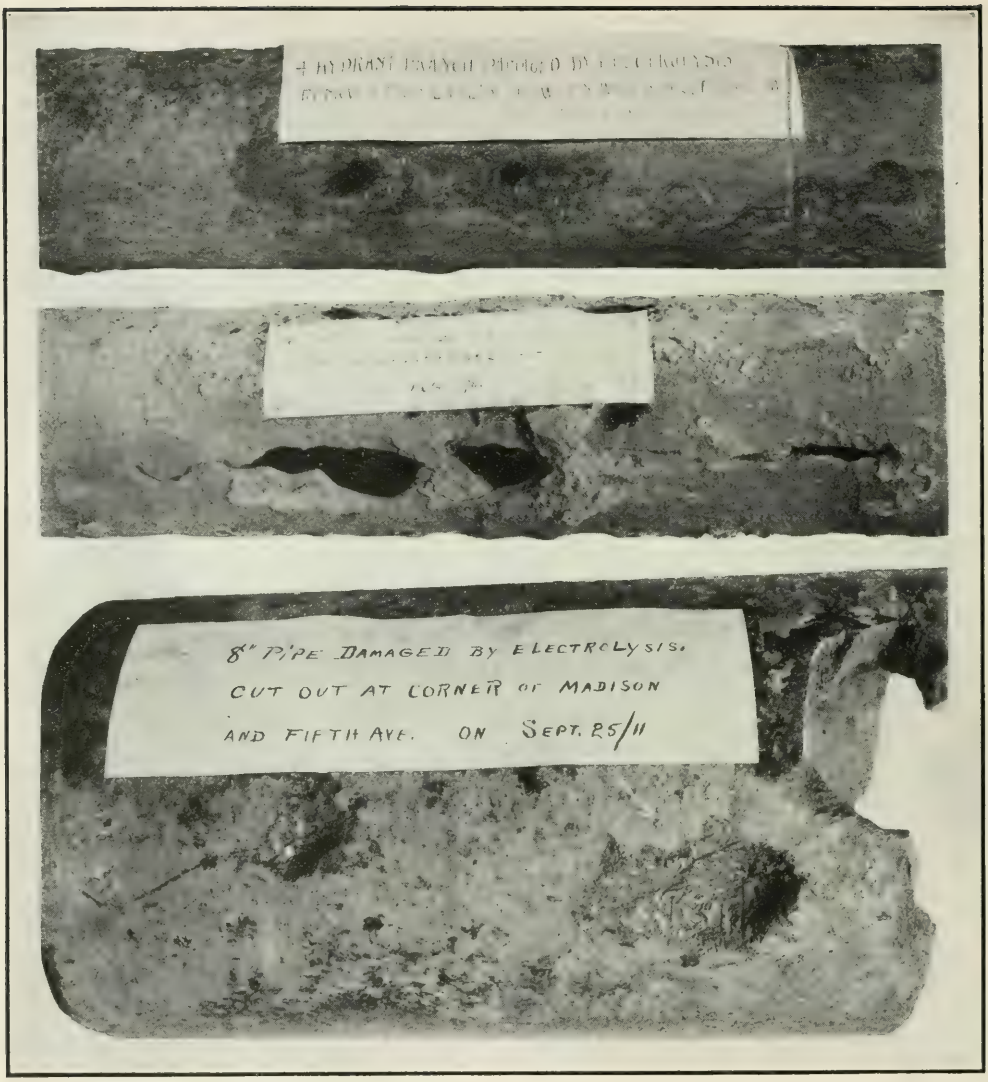
BENJAMIN BROOKS

AT one of the recent cement shows appeared an interesting young engineer with a display of disintegrated or disrupted concrete blocks—certainly a very novel and unexpected exhibit for a cement show. While a dozen exhibitors about him were engaged in making concrete blocks, he was industriously engaged in breaking them—but not with a hammer. His special method is to mold concrete into six-inch cubes each with a small metal plate in its center to correspond to reinforcing bars. When the blocks are thoroughly hardened he places them in pairs in a tray of water, connects the metal plates to the wires of an ordinary dry cell battery and invites you to return day after tomorrow. When you return, one of the concrete blocks is broken.

The name of this destructive young engineer is W. G. Middleton; but his object is not destruction of concrete; on the contrary, it is the saving of reinforced concrete, telephone cables, water



THE SORT OF MAP ENGINEER W. G. MIDDLETON PREPARES FOR KEEPING TRACK OF AND CONTROLLING "VAGRANT ELECTRICITY" IN A CITY.



WATER PIPES IN VARIOUS PARTS OF CHICAGO DESTROYED BY ELECTROLYSIS.

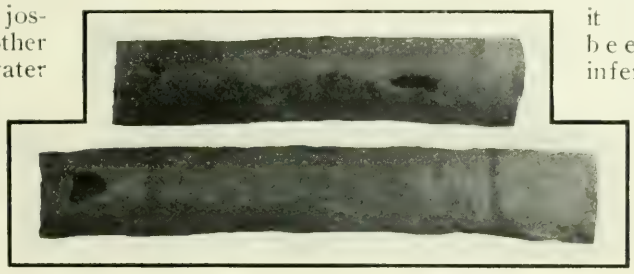
pipes and the like from destruction by vagrant electric currents. He first explains how an electric current that would not suffice to exterminate a sick kitten yet has power to disrupt sound reinforced concrete or to puncture the heaviest iron pipe made; then he propounds the cure, or rather the prevention.

When he connects his embedded metal plates to the battery wires, the current flows out through one wire, down through the embedded plate, thence through the water that has soaked into the concrete, across the water tray, in through the other water-soaked block, and so back to the battery. The trouble comes at the point where it leaves the first plate. It appears impossible for a current to leave a metal conduit of any sort, save, possibly, the precious metals without corroding or rusting it at the point of departure. The corrosion on the embedded plate accumulates and swells until the pressure becomes so great that the concrete is disrupted.

Mr. Middleton's exhibit includes also an interesting collection of disintegrated water pipes, gas pipes and telephone

cables, all destroyed the same way by vagrant electric currents.

When one contemplates a large city from the electrical standpoint—the thousands of heavy currents always being sent out on trolley wires, lighting circuits and smaller individual systems, all hunting for someway home again, crowding each other off of car rails into steel bridges and elevated roads, jostling each other along main water and gas pipes, jumping to the reinforcing bars of some long concrete sewer, short cutting through an acre of wet ground and crowding again onto the car rails, the wonder is that far more destruction has not already been wrought than appears. When Chicago's water department estimated that two-thirds of the water pumped to the city was lost, they attributed most of this loss to leaky pipes rusted and punctured by stray electric currents. This seems a perfectly plausible explanation, for one of the first reports on phenomena of this kind was made at least fifteen years ago when a suburb of San Francisco was very nearly cut short of water because the electric currents generated by the decomposition of rubbish in a dump concentrated on a water main, just as the rain on a wide area might all flow to one culvert —and this was in the days when electric currents were few and far between compared with what they are now.



VAGRANT ELECTRICITY ATE HOLES IN THESE LEAD WATER SERVICE PIPES.

Just about one year ago an electrical engineer was called in to discover the reason why a fine reinforced concrete packing house near New York City, only five years old, was disintegrating and falling about the ears of the proprietors. A few days investigation with the proper instruments showed him that the electric lighting system within the building had become fatally mixed with the reinforcing system, the moisture of the packing house affording a suitable electrical go-between for the two, and that the resulting corrosion of the bars was bursting the concrete beams. In making his report he warned all other builders of the conditions he found, stating that "during the last few years there have been persistent rumors of injury of this kind . . . but for obvious reasons the architects, designing engineers and owners of damaged buildings have not cared to reply, and it has therefore been wrongfully inferred that no cases of failure have been caused by electrolysis."

What went on in this building on a small scale must obviously be going on in the damp underground of every large city on an enormous scale. It is high time therefore for experts on vagrant electricity. The reason we have not had more of them is because electricity at work is very different from electricity wandering about without visible means of support. A wire full of "juice" is one thing; but an acre full of juice is another. Once a current enters the earth it is free to mix all other currents and swap voltages with them, so that a man used to following definite circuits is lost. It became Mr. Middleton's special hobby to take up electricity where the other man left off and he has evolved his own original system of investigation. When a hod carrier empties his load of mortar on the middle of a mortar board, the mortar stands highest in the middle and gradually runs off to a thin layer all around the edge. Similarly, if a congestion of trolley cars pours into the earth at one point a volume of "juice," the electric voltage is raised at that point and fades down to nothing at some point, say three miles off. A city may have one electric high point, or half a dozen with low spots between, according to the condition of the soil, the ramification of its buried conductors and the points where "juice" is poured in. The first step in the investigation is, then, to prepare a map of the town showing the

highs and the lows, just like a weather map with its curves showing zones of equal barometric pressure, its high point and its low point. But to measure the difference in voltage between two points, say five miles apart, requires a wire connection between them. Such an electric map would then be a tremendously expensive matter to prepare? Not at all, according to Mr. Middleton's method, for he has not overlooked the fact that nearly every town is already provided with wires admirable for the purpose—the telephone system.

While he sits at a central office with a city map before him and his supersensitive instruments about him, his scouts go to different points all over town, make appropriate overtures to telephone subscribers, ring up the chief, give their locations and make their ground connections, while he watches the needles and sets down the difference in voltage on the map. A lot of observations must be made, of course, to check variations; but in the end it is the simplest thing in the world to draw in the zones of equal voltage and disclose the location of the "highs" and the "lows." The map is the key to the whole situation. Suppose, for illustration, a flume running along a mountain side to carry water for an irrigation system began to be overloaded and to spill water. The water, once over the flume's edge would begin rushing down the mountain side to the valley below by the shortest route, would undermine the flume supports, break it down, and would never reach its destination. An underground telephone cable or a bonded car rail, or a water pipe carrying current, is in an analogous situation when the current jumps it and, taking advantage of a difference in voltage in the earth, runs away toward an electrically "low" point. Two cures are available in the case of the flume—either to make it bigger or to build a suitable branch flume at the point of overflow to carry the spilled water safely away. But to do so we should have to find a suitable low point to carry it to. Similarly, for the overcharged cable or pipe—since it cannot be made bigger without great expense for additional copper, it must be made electrically safe by being connected with the point where the voltage is the lowest. Now comes in the map. After the guessers and the experimenters are all through, it is a simple matter for Middleton to join securely to the overcrowded rail or cable a heavy wire leading directly to the low point. With an all metal avenue from the highest to the lowest point, no current would then be fool enough to wander about jumping from one line to another, and the destructive corrosion would at once cease.

By this extremely simple method two such copper conveyances, properly placed, one in the riser and one connected to the newly discovered low spot in the city, shown in the illustration, completely cured all the electrical troubles for the entire district.

ENTRANCE TO MINE OF WONDERFUL PRODUCTIVENESS IN THE MAZAPIL COUNTRY.

STREETS PAVED WITH GOLD

RECENTLY an American mining engineer was looking over some abandoned gold smelters at Mazapil, an old Mexican town buried in the mountains. When he returned to civilization he carried with him several bricks from the buildings of Mazapil and some samples of slag which he turned over to the company assayer.

The mining engineer had suspected that with the crude mining operations in vogue at the time of the former operations there would be some loss in extracting the gold from the ore, but he was hardly prepared for the assayer's report, stating that the bricks and slag ran nearly five hundred dollars to the ton, gold, silver and copper.

He reported the matter to his company and a quiet investigation was ordered, where it was ascertained that the assayer's figures were not exaggerated in the least and that the streets of Mazapil were literally paved with gold and silver, to say nothing of a high percentage of the baser metals: copper, lead and zinc.

THIS GARDEN IS SURROUNDED BY A MILLION DOLLAR GOLD AND SILVER WALL.

Representatives of the company were sent to the town and they quietly bought up all the property possible from the natives. The huge Spanish cathedral was excepted as the priests refused to sell this structure. The natives being ignorant of the value of their pavements and dwellings sold out for a comparative song and the company is now in possession of all the old smelters and their huge slag piles, the garden and its wall and nearly all the old buildings and pavements in the town—even including the post office!

They were about to start operations for the removal of the bricks and slag to modern smelters at Concepcion del Oro, by means of aerial cables, when the Mexican Revolution took such a serious turn as to put an effectual stop to all mining operations in that district for the time being. When this work will be resumed, it is difficult to say, because of the present badly unsettled outlook in Mexico.

HOW COULD SO SMALL A BOAT DO IT?

HOW a little row boat could float the weight of a street car down a river would not be easy to explain. That appears to be what is happening in this picture, but it's only an illusion. What appears to be a river is a flooded highway and the car is resting firmly on submerged rails. There was barely enough water in the road to float the flat-bottomed row boat. The car is the rolling stock of the rural horse car line from Strong City, Kansas, to Cottonwood Falls, a transportation system now nearly a quarter of a century old.

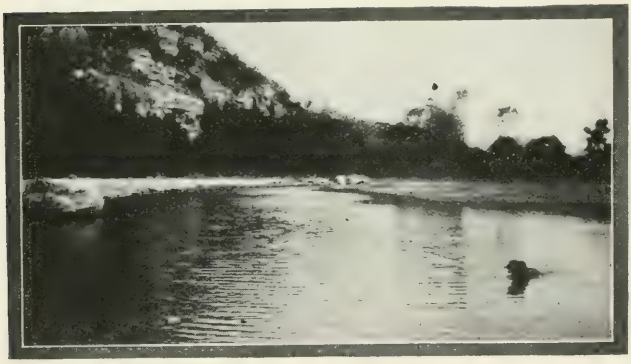
HEAVY LOAD FOR A SMALL CRAFT.

Early in the autumn of this year the river suddenly disappeared, or went dry, to the utter amazement of the residents of that section. Investigation showed that the river had disappeared into a large hole, or cave-in, near San Marcos, called "The Halifax." The Blanco, the night before its disappearance, was more than a hundred and fifty feet wide and there was a good current. It is thought that the bottom of the "Halifax" became thin and dropped into a subterranean passage and that the water followed.

A mile farther down stream the Blanco reappeared from its underground course.

To save the stream from total loss citizens actually cemented the bottom of the river, hole and all. The hole was filled up. A great amount of concrete was required for this purpose and perhaps such a course has never had a parallel. This operation saved the river and it is now flowing on its way as if nothing had happened.

By its feat of patching a river in this fashion concrete once more proves its claim to the high position it holds.



THE BLANCO RIVER, TEXAS, JUST BEFORE IT DISAPPEARED.

CEMENTING A RIVER'S BOTTOM

THE Blanco River, one of Texas' most beautiful streams, was "lost" recently and was "found" later by most unusual means. The Blanco is a good sized river for the semi-arid Southwest. It flows into the San Marcos near the city of San Marcos, and is a winding stream with high cliffs and forests on either side.

THE RIVER IS GONE.

OLDEST OF INDUSTRIES

THE pearl fisheries of Ceylon are said to be the oldest industry in the world. For over three thousand years the pearl oyster harvest has been gathered by the natives, who, skilled in diving, have handed down the industry from one generation to the next. Of late years the remuneration has been uncertain. Some time ago the government leased its rights to a foreign concern for a specified sum annually. Pearl fishing in Ceylon today is somewhat of a speculation.

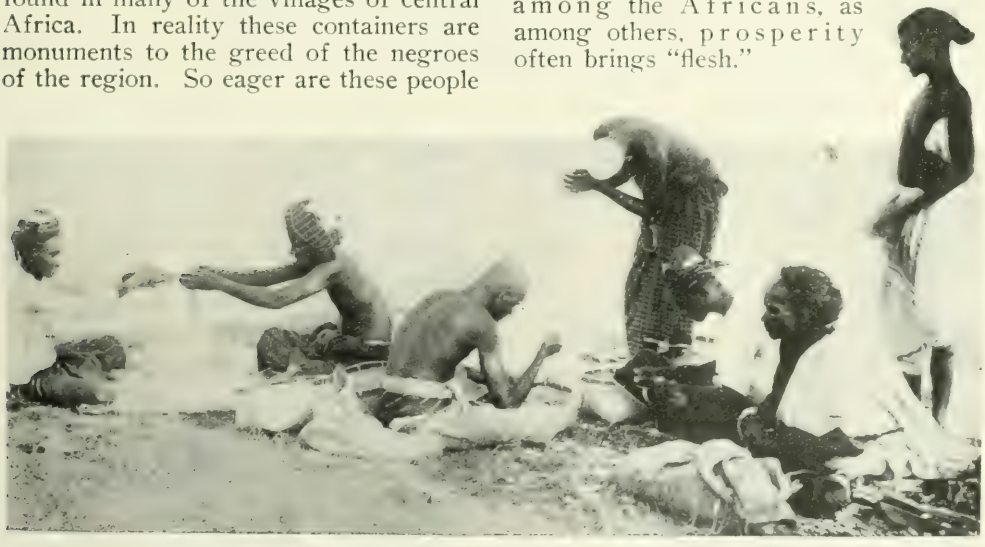
The greatest care is taken lest when the shells of the bivalves are opened any of the precious gems be lost or stolen. A very strict watch is kept over the natives who are employed in this kind of work, but in spite of the greatest precautions some of the smaller stones are frequently concealed. The refuse from the shells is very carefully examined subsequent to this first examination. Even the dried dust of the oyster is carefully sifted, as is shown in the accompanying photograph.

HUGEST OF BASKETS

THIS picture shows some of the largest baskets in the world, for they are capable of holding half a ton of corn apiece, or one thousand pounds. These Brobdingnagian receptacles are to be found in many of the villages of central Africa. In reality these containers are monuments to the greed of the negroes of the region. So eager are these people to gratify the demands of the flesh, that the stomachs of little children are said to be forcibly distended by their parents, who compel them to drink large quantities of water to produce this result. The stomach of an adult is said, as a result of this treatment, to be three times

THE LARGEST OF THESE BASKETS HOLD HALF A TON EACH.

that of a white man's in size. Hence for such abnormal appetites it is highly proper, one might think, that ample provision be made for the storage of food. These natives make a beer very different from that of the European. This they drink in enormous quantities, it may be taken for granted. The beverage is said to be very nourishing, which may in part account for the rather huge paunches that are often to be found proudly carried about by the black chieftains and other prosperous citizens of these tribes for among the Africans, as among others, prosperity often brings "flesh."



SIFTING DRIED DUST OF THE OYSTER IN A SEARCH FOR PEARLS.

AFTER THE TYPHOON HAS PASSED.
A business street in Manila.

THE TERRORS OF THE TYPHOON

By

MONROE WOOLEY

A great typhoon, which swept the Philippine Islands Oct. 16, 1912, destroyed 1,000 lives and wiped out property valued at $25,000,000.

THE other day five Japanese fishermen were arrested in San Diego for being in this country illegally. They came to California shores in a fishing junk, the first of their race, so far as history records, to make the perilous passage from the Far East in a junk. And a fishing junk, as the name implies, is the last thing in sailing craft to go world-cruising in.

But the fishermen did not cross the Pacific of their own accord. While fishing off their own coast the junk was caught in a typhoon, and blown a thousand miles off its course. The distance may sound somewhat exaggerated. Don't deceive yourself, for typhoons refuse to deal in trifles, such as a few miles or leagues. Adverse winds and currents did the rest, leaving the junk a wreck off Point Loma, southern California.

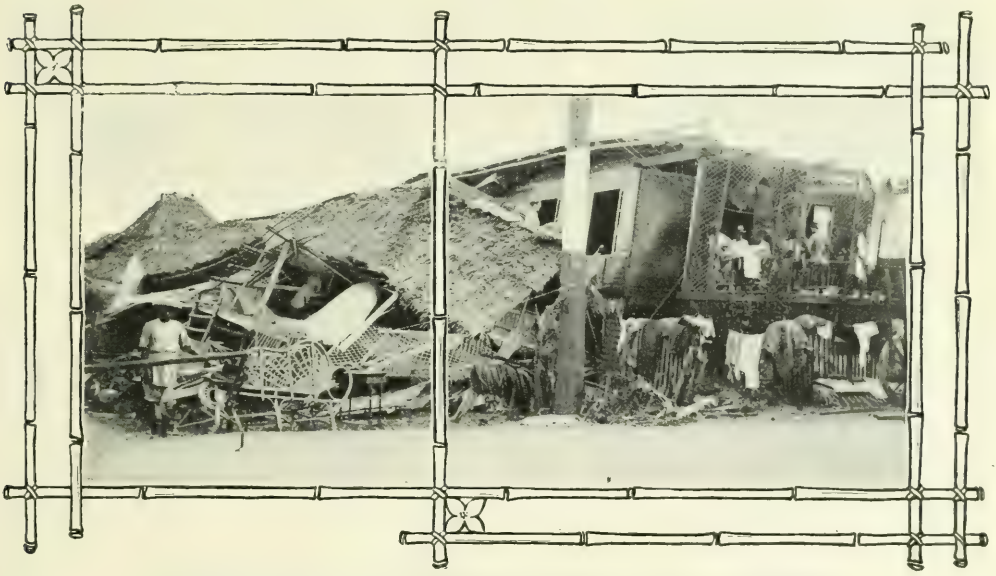
Typhoons were unknown to most Americans a dozen years ago. Now, owing to circumstances attendant upon conquest, they are clamoring for acquaintance. They have their home in the China sea, where the hideous dragons are supposed to exist, and the most of them,—the very worst, in fact,—first come into lively activity in the vicinity of the Philippines.

Webster defines a typhoon with altogether too much brevity. Before the Spanish-American war, when Americans generally were unfamiliar with the antics of typhoons, the definition sufficed for most of us. Only sea-faring men knew the truth. The dictionary says a typhoon is a violent whirlwind. But don't you

believe it. Just be patient and content to take your description a little more in detail. Typhoons are somewhat more disturbing than the breeze from an electric fan,—that is after you have weathered one.

The awful fury of the China sea typhoon can be far better appreciated in print than in reality. Old "salts", veterans in riding out the wrath of God upon the waters, shake their grizzled heads prophetically and busy themselves frantically battening down every movable thing aboard ship, as do the land lubbers ashore in that part of the world, when the barometer indicates dense, seemingly horizontal sheets,—this is but a child's simple picture of the infuriated elements constituting a full grown typhoon.

Filipino folklore is full of characteristic antics of erratic typhoons. One of them, universally believed throughout the islands, is to the effect that many years ago a Chinese junk was literally picked from the crest of an imposing wave and carried like so many grains of sand to a final resting place on the summit of one of Luzon's highest mountain peaks. There, it is stoutly asserted, it may be seen today. Though perhaps overdrawn this myth is nevertheless indicative.



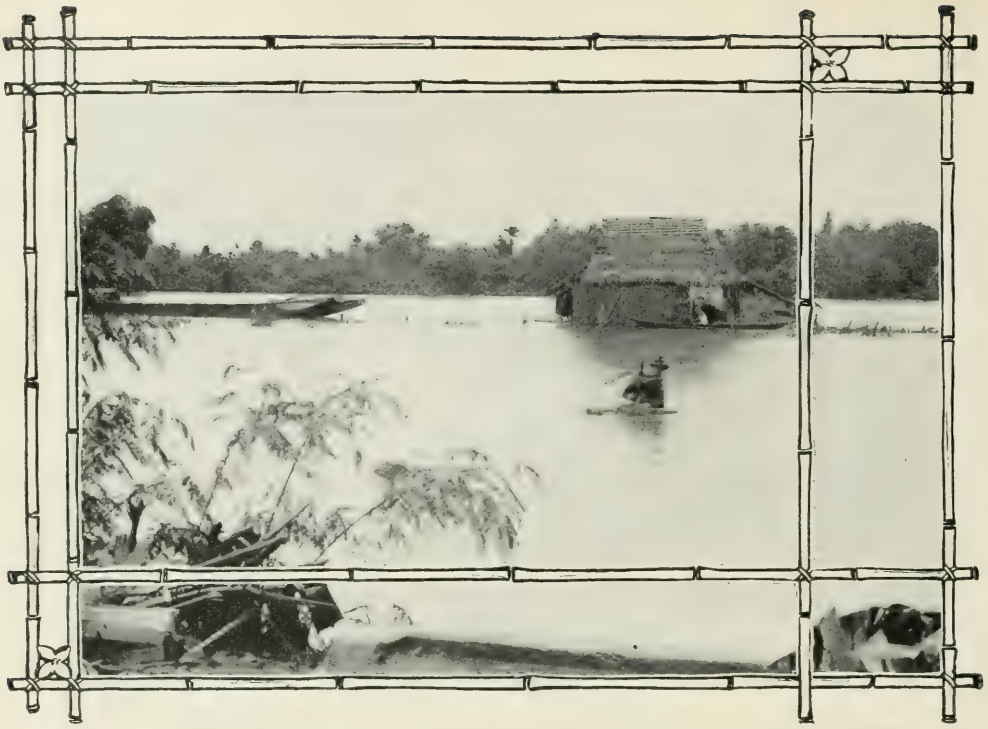
WHAT REMAINED OF TWO MANILA HOMES AFTER A TYPHOON.

the approach of the merciless monster. We have nothing in this country comparable to a typhoon. There is nothing in the storm line on earth exactly like it. Our cyclones spend their strength in a narrow sphere. At best they do not travel far, though they are often terribly destructive. Contrarily, the typhoon knows little of territorial limit. It is a stupendous mixture of cyclone, tornado, and electrical, with the wind blowing four ways at once, the seas running in dizzy mountains, maddening whirlpools, and sickening abysses, every object on land bending before its mighty strength, with the rain spreading in

When we remember some of the seemingly impossible things our own cyclones do this story is not difficult to believe. Anyway, as war has been said to be hell, so has it a fiercer counterpart in struggling for life and safety in the throes of a typhoon.

Some of the severest, most destructive typhoons known have occurred in the China sea, and that means the Philippines, —since the beginning of American occupation in the Far East.

Every now and then giant ocean liners come limping into Pacific coast ports, to Vancouver, Seattle, and San Francisco, after a bad encounter with the enemy.



IN THE PROVINCES SMALL STREAMS SOMETIMES SWELL INTO GREAT RIVERS.

It is not necessary for the crews to talk. The ships tell their own stories of the disaster.

Typhoons have cost our army many thousands of dollars in destroyed property. The trans-pacific transport service, as well as the inter-island transport service, has suffered to great extent. Out of a transport load of mules enroute to the Philippines in the early days of American occupation but a single mule out of a large shipment was landed alive. As the government necessarily figured in the loss of all the animals the survivor was a mighty costly piece of mule flesh laid down at Manila. The ship was at the mercy of the storm for hours, and a dozen times she was given up for lost. The crew was compelled to go into the hold and shoot down those of the stampeded, crazed animals that had not been killed by the violent tossing of the helpless ship. Carcass after carcass was washed overboard and the men had to be tied to the rigging as they worked to prevent their being swept into the sea.

The worst typhoon experienced on land in the Philippines since the arrival of Americans was that of September, 1906. In that awful storm there was scarcely a building of light material in the entire city of Manila, which has a population of a quarter of a million, left standing, and in the capital and the outlying provinces thousands of people were either killed outright or subsequently died of fright and exposure.

The storm started at about one o'clock in the afternoon, and at two the wind was traveling at an appalling velocity. By three o'clock the streets of Manila were flooded and filled with debris. Telegraph and telephone wires and poles were down, whole residences lay crumpled up in the streets, and the street car service was demoralized.

Nearly a dozen coasting steamers, six of them craft of considerable tonnage, went down with all on board. The Cantabria, a particularly fine steamer, had a large American passenger list and a valuable shipment of gold and silver coin aboard. She sank somewhere off the Batangas coast, between the islands of Luzon and Mindoro, and so complete was her destruction that only a small amount of debris from the wreck could be found

after the storm, and none of the bodies were recovered.

On the other hand, the wreck of the Coast Guard Cutter *Leyte,* manned by Americans and carrying American officials, was scattered for many miles along the coast of Samar, just after leaving a comparatively safe haven in the port of Legaspi, where the captain of the vessel was admonished by Spanish master mariners not to put to sea. Remains of the victims of the *Leyte* wreck were gathered up in pieces for many miles along the rock-bound coast of the island. Of the passengers and crew only a Chinese cook survived. He was thrown high and dry on a rock promontory extending out from shore, but never after could he give an intelligent account of the catastrophe.

In this same storm many people, especially poor natives, lost their lives in Manila bay and along the beach. The crew of one of our big ocean-going transports, anchored in the bay, plainly saw a great number of Filipinos, men, women, and children, drown on the breakwater, while the ship stood by helpless. Futile efforts were made to get lines to them, but no human could throw a line through that storm. Besides, the ship had all her anchors out and was under steam to keep from crashing into the breakwater. The natives tried to run along the breakwater to shore but the torrents that broke over the masonry and crushed stone swept them to eternity

Many hundreds of persons, Filipinos, Chinese, and Japanese, lose their lives annually because of typhoons, most of them upon the water. Despite the reputation of the China sea as a treacherous body of water, fishing junks by the thousand venture far out from home in quest of catches. Whole fleets numbering several hundred sail have been known to perish in a few minutes. In spite of this, small launches frequently make the passage from Honkong to Manila, but usually at seasons when the typhoon is on vacation. Then, too, as a rule, only Chinese crews are so foolhardy as to risk the trip.

Many of the thatched huts throughout the Philippines, built high off the ground to avoid dampness, have an unusual amount of surface compared to the weight of the building. What a terrific typhoon does to these light little shacks of the peasantry, the average weighing only a few hundred pounds, can be imagined. The wind doesn't have to travel at a very great rate to blow them over, and when the velocity reaches seventy-five to a hundred miles per hour, or even more, they are literally blown to the four corners of the archipelago.

It always devolves upon the government, municipal, provincial, or insular, and sometimes Federal, to care for the destitute rabble.

CAN A BUSINESS ARCADE BE BEAUTIFUL?

IN Riverside, California, a city which has developed many little ideas for municipal adornment, there is a certain arcaded street which is devoted to business, yet is exceedingly artistic. A trellis

HERE BUSINESS DOES NOT DRIVE BEAUTY AWAY.

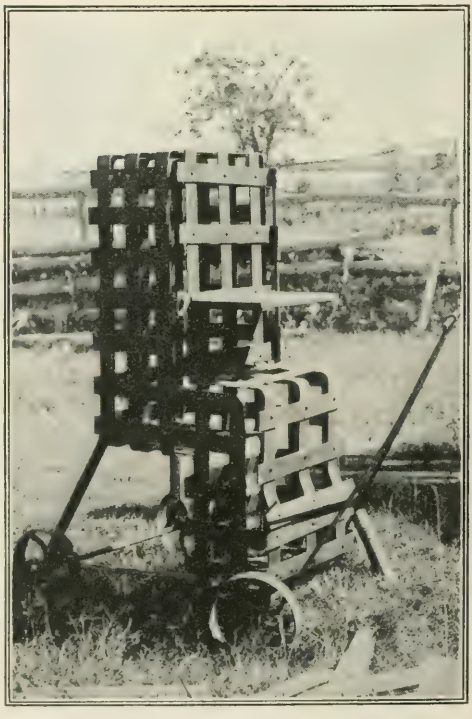
overgrown with vines covers the sidewalk and arches extend along the curb. The show windows have window ledges with growing flowers, and even the advertising signs that hang before the stores and offices are designed on artistic lines. Thus the railroad office uses a sign board which presents the outline and colors of a piece of Indian pottery, and the barber shop displays instead of the regulation striped pole, an old-style basin with a piece cut out of the edge to fit under the chin. It is a barber's sign familiar in the old world, and will be remembered by readers of Don Quixote as the "helmet" captured by that crackbrained hero. As the photograph shows even a business street can be artistic

CHAIR BUILT FOR TRAMPS

OF late Bingham, Me., has been able to say that it had fewer tramps than any other town of its size in the State. The reason for this is a "tramp chair."

This chair is made in the form of a common upright chair of strap iron but is encased, the door being made of the same strap iron material. It is on wheels and can be moved to any part of the town. Not a great while ago a tramp went to the village and there being no lockup there, the officers had occasion to take care of the man, and he was put into the tramp chair.

It is not known how long the tramp stayed there but at least long enough so that he wanted to get out of the town as quickly as he could. He evidently got word to his brother tramps and warned them to stay clear of Bingham, as no tramps have been seen in the town since.



DELIGHTFUL SEAT FOR THE WEARY—A CHAIR BUILT FOR TRAMPS.

HELPING THE SILK WORM SPIN

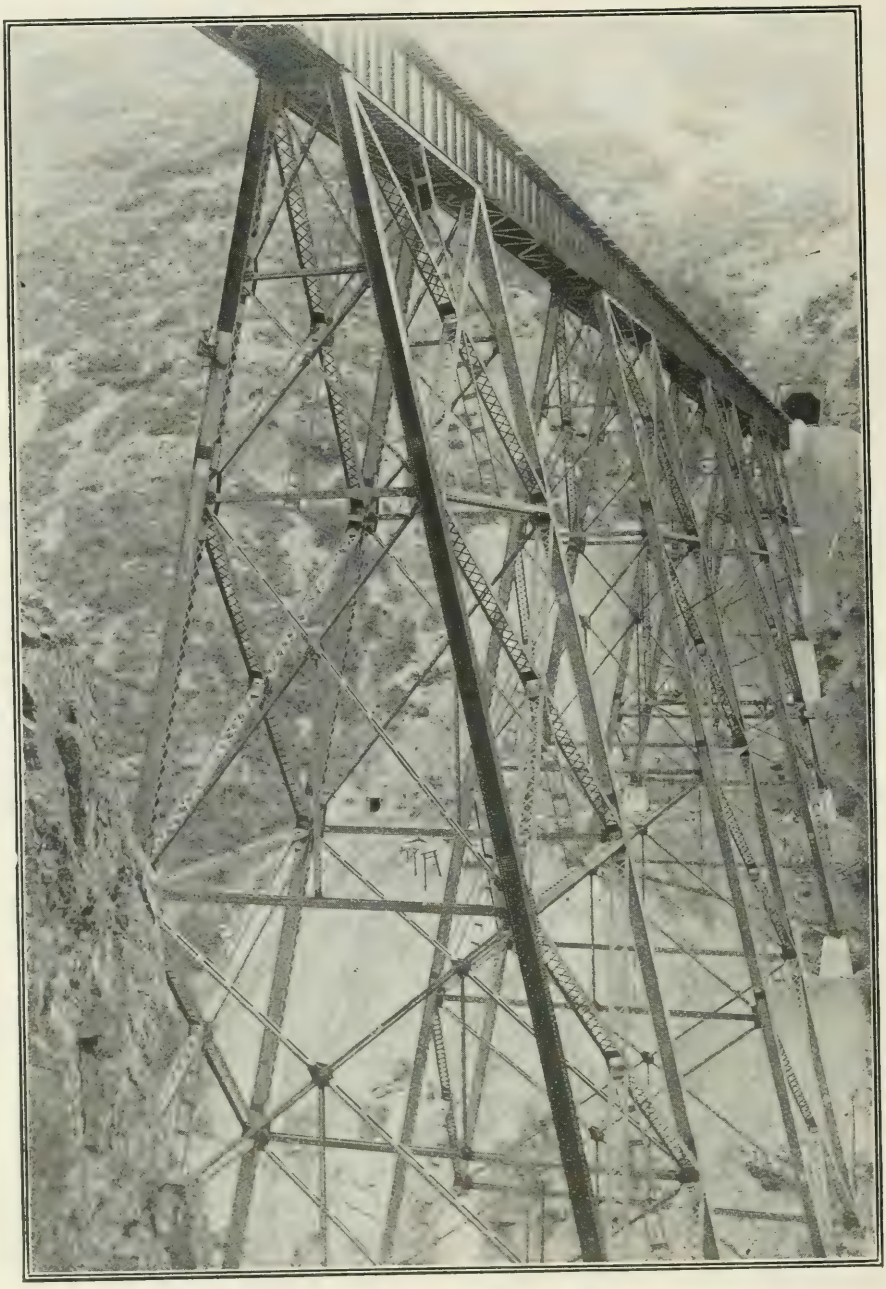
MAN by his art can assist nature to a considerable degree, even down to the work of turning out apparently so insignificant a thing as the spinning of a cocoon by the silk worm. Observation has shown that the tiny spinners do not object to having little square openings provided for them in which to set to work at the preliminary task of going into the chrysalis. In fact they seek out just such cozy corners with eagerness. So the silk grower in order to satisfy this want has provided in these modern up to date days little ladders in the interstices of which the silkworm may peacefully spin his web and peacefully go to sleep. The ladder or frame, when filled with the newly spun cocoons, is placed upon a table, where the cocoons may be removed at leisure. Children in particular take great delight in assisting in the work of removing the tiny, fuzzy oblong balls.

GATHERING SILK COCOONS FROM A SPECIALLY PREPARED FRAME.

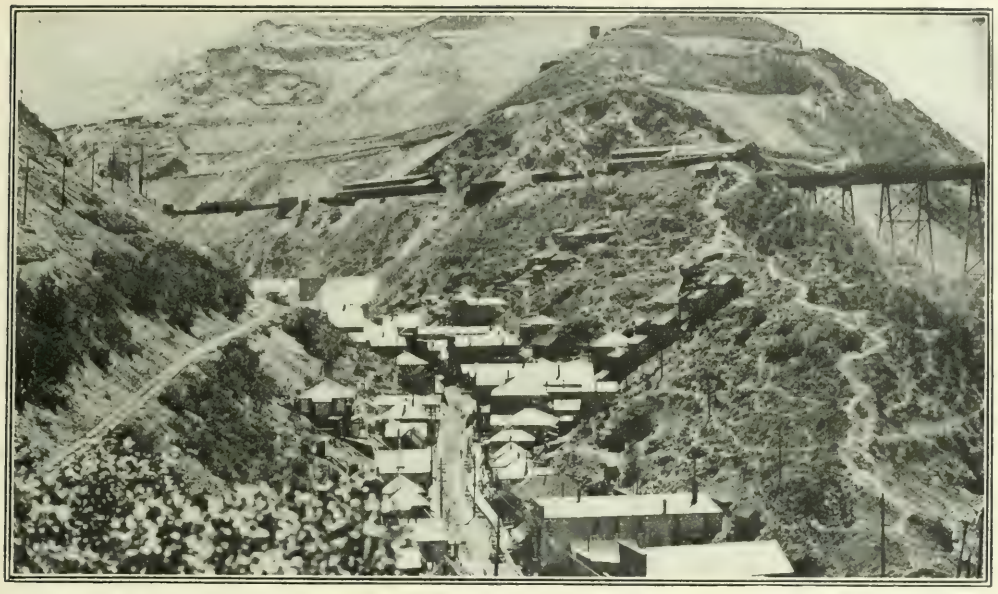
EGGS TWENTY YEARS OLD

MOST peoples prefer aged wines, some prefer cheese that is no longer new, but it takes the Chinese to devise dishes that are totally unknown—at least as to method of serving—in the Western world. How would you like to eat, for instance, eggs that are twenty or more years old? Even the most hardened American cold storage offender would scarce have the hardihood to offer eggs that had their origins in so distant a past. And yet just such eggs as these are considered to be great delicacies by our fellow republicans, the Chinese. "Ripened," is the happy designation that is applied to this very ancient product of the faithful hen. They are preserved in a rather curious fashion. They are first coated with a layer of black earth, or they may be encrusted with the refuse of the barnyard. Strangely enough, when, in after years the egg (the foreign coating having first been removed) is opened, the egg proper, that has reposed all this time within the covering of black earth, is found to be snow white; those eggs that were covered with the whitish grey protection are found to be of a glossy black. But of course they are not in a bad condition, that is, bad in the ordinary sense of the word, though it would doubtless take some courage on the part of a foreigner to eat one of these pieces of mummified food.

OUR COLD STORAGE MEN COULD LEARN SOMETHING FROM THE CHINESE—THESE EGGS ARE TWENTY YEARS OLD.



TWO HUNDRED AND FIFTY FEET ABOVE A CANYON BED.



"IN A LONG NARROW GASH BETWEEN PEAKS RISING TWO TO THREE THOUSAND FEET ABOVE IT, LIES BINGHAM."

PANAMA DUPLICATED

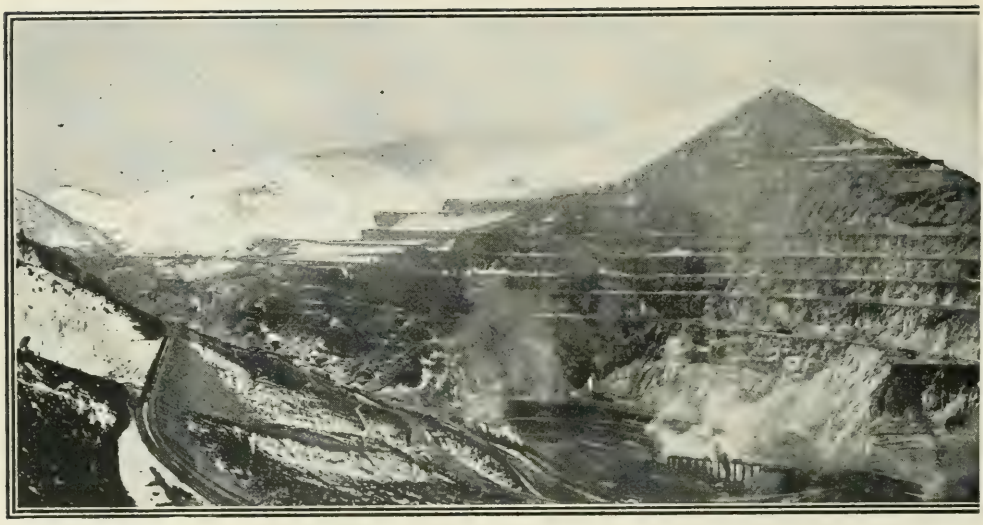
By

GEORGE FREDERIC STRATTON

IN the justly famous Culebra Cut at Panama, the splendid equipment of steam-drills, steam-shovels, powerful locomotives and cars is picking up and handling, not quite but nearly, three million cubic yards of earth and rock each month. One great association of copper mining companies, commonly known as the "Porphyry coppers" in the mountain region between the Rockies and the Sierras is handling, by similar equipment two million yards of ore and rock each month; and the difficulties due to the nature of the ore and the elevation at which it is found, are greater than at Panama.

At the Culebra Cut the highest peak is five hundred feet above the Canal level. In the Oquirrh Mountains in Utah steam-shovels are working at three times that height—fifteen hundred feet above the level of the canyon where straggles the strangest mining town in America; the town of thirty-five hundred inhabitants composed of a score of different nationalities; the headquarters of the mine executives and the workers, and the only outlet over, under, or across twenty miles of the most rugged mountains in North America. There, in a long narrow gash between peaks rising two to three thousand feet above it, lies Bingham, one of the greatest copper producing camps of this world.

A ride from Garfield, on the edge of the Great Salt Lake, over the railroad built by men interested in the Utah Copper and Boston Consolidated Mines, carries you across sixteen canyons and through four tunnels. When you are not riding one or two hundred feet above a canyon bed or beneath a rock tunnel roof, five or six hundred feet thick, you are riding—for the rest of the twenty



PANORAMIC VIEW OF THE WEST
This shows the vast extent

miles—along narrow ledges cut in the faces of the mountains. The whole trip fails to show one spot where man could build a dwelling without having his front entrance at three-story level below the rear entrance, or vice versa. That road carries you into Bingham.

Better still, far better, is a saddle ride through the canyon; when, by a highly appreciative response from your horse to your stop-signal by voice or rein, you have time to look up—always up—and gaze with awe into the thousands-of-centuries-old, hoary mountains, which are so close to you that a deviation of six feet from the trail would, at most points, put your horse's forefeet on a level with your own.

Riding up that trail you, now and then, pass under gigantic steel legs, one hundred fifty to two hundred twenty feet long, which carry the High Line Railroad tracks; and you look commiseratingly at a train whizzing along at twelve or fifteen miles an hour, which is high speed for very heavy grades, and curves where the engineer and rear-brakeman exchange cynical remarks across a hundred-and-fifty-foot chasm about their respective directions; one going east and the other going west, but both going up.

Your commiseration is for the few passengers in the train who, while reclining in the lap of luxury as materialized by upholstery and cigars, are praising the roadbed or discussing Standpatters and Insurgents. You, down in the canyon, have neither eyes nor thoughts for anything but the solemn primeval mountains. One-half hour of slow silent riding past the abysmal cross canyons and the sudden sheer abrupt walls of rock, produces a state of mind in which no surprise would occur should a primeval gentleman with much hair, but little else on his person, and with a stone club welcomingly and enthusiastically displayed, appear and express his desire for a son-in-law, or an alternate of fresh meat.

So riding, you reach a sharp turn in the trail and catch an opening view of Bingham; the town on which the sun rises at nine-thirty and sets at three p. m. on the longest day of the year. You ride up that narrow, curving, thousand-foot-walled street before you reach a point where you can see the greatest open-mining exploitation in this world, not even excepting the famous Kimberly mines in Africa; and at that point the view bursts upon you in unparalleled grandeur of gigantic natural and apparently invincible difficulty; and, in the same superb view, the magnificent exposition of determined, irresistible and indefatigable subjugation of those difficulties by man.

SIDE OF BINGHAM CANYON.
of the steam shovel operations.

Before you, is a mountain two thousand feet from the canyon level to its peak. It is being "stripped", which besides being a mining technical term, is peculiarly descriptive; for its former ancient and honorable robe of sage-brush and scrub-cedar has gone, and it stands in naked whiteness—a mountain of porphyry-copper ore.

Winding around it at levels of fifty or one hundred feet—one above the other—are railroad tracks. Twenty were in use when this was written, with a total length of fifty miles, but by the time it is printed several more will have been installed, for an army of men are there, with scores of powerful mountain locomotives; hundreds of steel cars; dozens of gigantic steam shovels and crews with the sharp quick-acting power drills. All are eating into that mountain; taking from it sixty thousand tons of material every twenty-four hours, twenty thousand tons of which are millable ore. Coming down to concrete figures that twenty thousand tons of ore, after a trip through the immense crushing, concentrating and smelting plants, results in 200 ounces of gold, 2,000 ounces of silver and 400,000 pounds of copper; with an aggregate value of $75,000.

That is the daily average!

Join with me in a day's experience among those gigantic mountains.

I was sleeping very soundly that morning, due to the hours I had spent in saddle and on foot the previous day. About half past five an explosion occurred which brought me to my feet instantly. It was the regular morning blast, or rather a succession of them for ten minutes. Over three tons of dynamite or other explosives are used each morning, between the changes of the night and day work-shifts; and the same quantity each evening. In those stupendous hills, where echoes re-echo from scores of surrounding mountains, the reports were terrific. Field artillery would be like little .22s in comparison. It would take heavy fort or battleship guns to rival that morning and evening dynamite play.

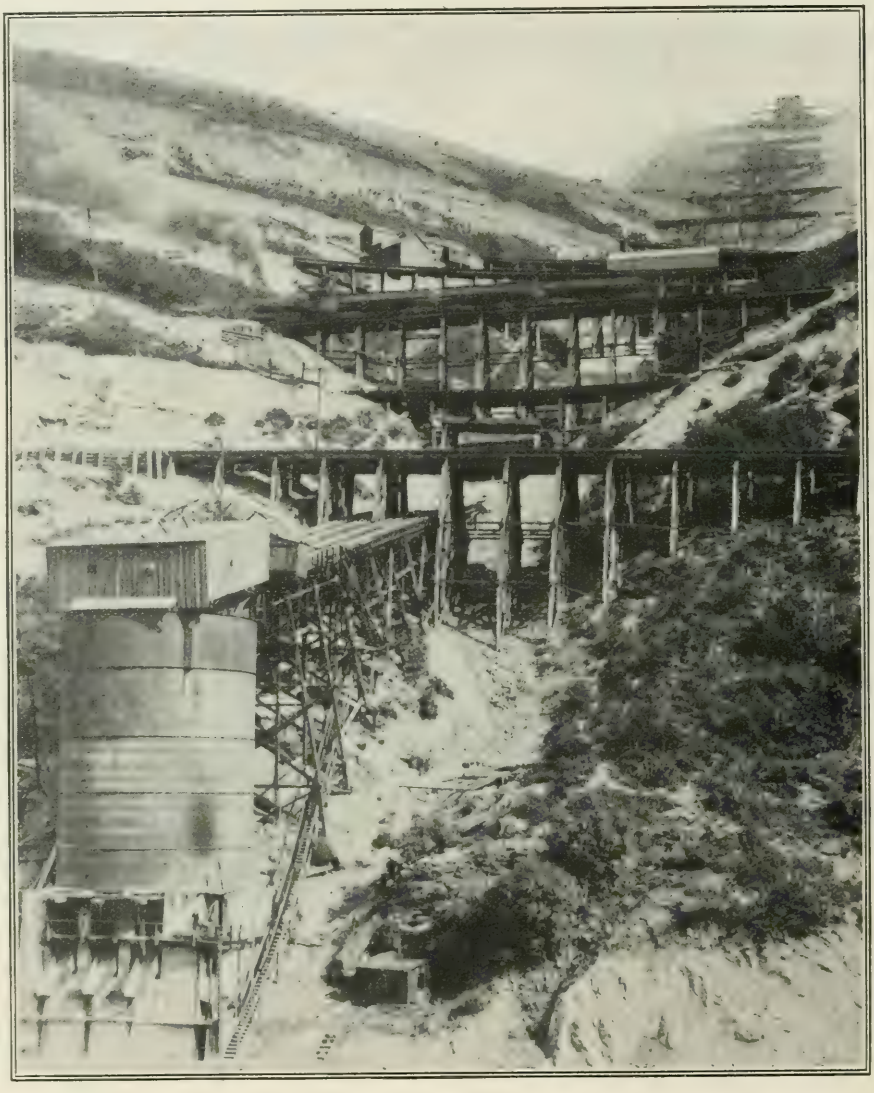
I dressed, had breakfast and was then introduced to the driver of a four-horse light freight wagon in this manner:

"Baldy! This gent's a magazine writer. He's after some dope about What's what, and Who's doing it. Give him all you can."

Baldy greeted me with a cheerful and impressive smile, and said pleasantly: "You'll get the dope if you keep your eyes peeled. If you want it through your ears, you'll get it—likewise an' also."

I climbed up by his side and we started up the trail. A half-mile ahead, and just clear of the town, a man stepped out and shouted, "Blast!" The team ap-

parently recognized the shout as warning instead of profanity, for they stopped instantly. On the third track up the mountain a locomotive was emitting and everywhere men were disappearing behind sheltering rocks. Then came the great puff of black smoke, the tremendous crash and the cloud of dust. It



SWITCH-BACK GULCH, OVER WHICH NINE TRESTLE BRIDGES CROSS FOR THE ORE TRAINS.

shrill little shrieks in quick and regular succession. On the tracks below it big steam-shovels and snorting locomotives with strings of cars were shifting back, is unusual to set a blast during working hours, but sometimes it is necessary, and then every precaution is taken.

I asked Baldy—(I heard no other

name) if accidents ever occurred from those blasts.

"Not so you'd notice it," he replied. Then he turned on his seat and nodded at the skeleton of a new building we had passed.

"See that? Now, look up there!" He pointed to a track six hundred feet up the mountain side. "That's the Rio Grande track on a seven per-cent grade. A couple of weeks ago a locomotive jumped that track an' came down the hill; caught two houses there an' piled 'em in the street an' itself on top of 'em. Pete Berkle says it rolled over seventeen times on the trip down. Says he counted 'em."

I had to believe him. That slope was at least forty-five degrees and comparatively smooth; and it was a six hundred foot drop.

"Anyone hurt?" I inquired.

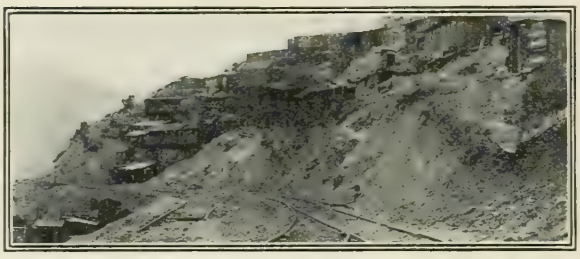
"Five passed in their checks," he replied, laconically.

A few rods further on we caught sight of a ravine which Baldy called "Switchback Gulch." The photograph I took shows nine trestle bridges at different levels, and cars which are filled with ore on the high levels are switched back and forth over those bridges until they come down to the level of the Bingham and Garfield Railroad, over which they are hauled twenty miles through the mountains to the great concentrating and smelting mills at Garfield.

Looking back and down the canyon we get a view of the town—or rather the town roofs; and with care we can trace the narrow crooked trail which forms Main Street. Midway of the town the canyon splits into two forks, Bingham Canyon and Carr Fork, each of which leads up to mines, mines and still mines. Over a score of companies are operating in this wonderful canyon, and for miles up those forks you find tunnel-entrances, great ore-bins, stamp mills and workmen's shacks. Overhead, looking in any direction, you see the lonely, weird, skeleton towers supporting the wires which carry the electric current from the moun-

"THE NARROW CURVING 1,000-FOOT WALLED STREET, CARR FORK, WHICH LEADS TO MINES. MINES AND STILL MINES."

tain torrents in the Wasatch Mountains, thirty—fifty—and a hundred miles distant, to the mine outfits. Occasionally you will be startled to see crawling along other of those curving cables—crossing wild canyons, and circling ragged—often snow-capped peaks, a big steel bucket, perhaps with one or two men in it. That is an aerial tramway, conveying ore, supplies and engineers from some outside mine to a smelter or railroad, miles distant.



SHACKVILLE.

But we are still at the base of the great mountain which is being demolished. In very distinct lines across that mountain may be seen the various levels on which the great shovels, the steam-drills, the squatty powerful locomotives and the strings of ore cars are continually in operation. It is from that mountain that ore and waste sufficient to fill over one thousand fifty-ton cars are taken every day. That is a stupendous quantity! The yearly load would fill a train of those cars extending in an unbroken line from New York to San Francisco; and the contents would make a double track roadbed for quite the same distance.

The trail we are on winds round the east base of the mountain. On the other side is another mountain upon which "stripping" is being commenced. Three or four tracks are now laid around the sides, and steam-shovels are at work on each of them, clearing away the upper strata of the earth and rock, down to the ore. This waste is hauled to such points around the mountain as require fills across gulches or small canyons, for the construction tracks; for this is called "construction" work. Later, destructive work will commence, for the ore crews will take possession and eat up that mountain.

We were joined here by a young engineer who was going to one of his company's mines further up the canyon. I expressed my astonishment that the monthly records of all the earth, rock and ore being handled by all the mine operators in the range was seventy-five per cent as much as at the Big Canal at Panama. He glanced at me—a little pityingly, I think. Then fixing his eyes on the great mountain dotted with steaming equipment and hustling work-

THE WALDORF—ASTORIA.

BINGHAM—THE TOWN ON WHICH THE SUN RISES AT 9:30 AND SETS AT 3:00 P. M. ON THE LONGEST DAY OF THE YEAR.

men, he stretched out his arm toward it all.

"Look at that! The stuff's there, in millions of tons. If the demand called for it, the Colonel would have equipment and force here in three months to change that seventy-five per cent to a hundred and fifty."

For the moment I was as much impressed by his enthusiasm and loyalty as by the great works at which we were looking. The "Colonel" is D. C. Jackling, the General Manager of the largest operations in the range—the Utah Copper Companies properties. He is also Manager of other great copper mines in Nevada, Arizona and New Mexico, and whenever an employee—big engineer or little sub-foreman—speaks of the Colonel, it is with a way of hearty admiration, for which there are reasons.

When Colonel Jackling associated himself with other capitalists, and took control of the old Utah Copper mines, they were of very moderate underground exploitation, with no startling exhibition of profit. The Colonel's first great development was to substitute open-mining for shafts and tunnels; to replace picks with steam-shovels. In the seven years of his management he has cut over twenty terraces across the great mountain, and has brought the annual output of copper from practically nothing to 150,000,000 pounds. He has built the twenty-mile high-line railroad; the most picturesque and difficult industrial railroad in the country; has largely effected the consolidation of the great Boston Consolidated mines (which adjoin those of his own company) and a dozen of smaller developments, with his own Company; and he has quadrupled the capacities of the concentrating plants and smelters by enlargement, and by equipment especially designed and invented for those immense plants. The various mines, with the operation of which he is associated, are now producing about twenty-five per cent of all the copper mined in the United States. Men, even the poorest of laborers, see these great achievements, and know that the orders come from one man, the "Colonel."

So, on an up the canyon; always up, and always coming into fresh view of some hoary old monster; grey, yellow, scarred and bare; but very venerable. Of every one Baldy has some story or legend to tell, although he is not a native of these parts. He has roped steers in Arizona and Mexico; driven stage across Nevada deserts, and trekked bullocks in Africa. With it all, his respect for cowwork stays with him. I was afterward told that on one of his excursions into Idaho he was offered and urged to take a job at sheep-herding. This, to the cowboy was mortal affront, and he met it by putting a bullet through his would-be employer's thigh; remarking that a sheepman had no business to be straddling a horse—"nohow!"

So the trip has its full measure of entertainment. At intervals we pass curious groups of shacks, for each of which Baldy has a title. One is Shackville; another Greektown; another the Waldorf Astoria. They are the residences of many foreign laborers—Austrians, Greeks, Finns, Poles, and Italians, who prefer knocking together a board shack and living in it, to living in the boarding houses or rented houses which all the companies provide. Usually these Shackvilles are perched high up on the mountains, but although far from law and order influences, I am told that serious disorder or disturbance is rare.

Romance and utilitarianism are strangely intermixed everywhere. A grim crusted mountain comes into view, on the slope of which bears are not infrequently found today; and in whose dark canyons treacherous Utes planned bloody raids upon the early settlers in the Salt Lake Valley. Close scrutinity shows a small black square spot half way up its side. That is a tunnel entrance. Near it, and below, are several buildings; a big ore-bin, perhaps, and a bunkhouse for the men. But it is all romantically picturesque, unless you go too close to the rough buildings. Then their sturdy commercialism stands out, commanding respect, at least, if not admiration.

Late in the day we come back to Bingham. As we approach the closely packed and impartially mixed dwellings, stores, saloons and amusement houses, a curious inclined double-tracked railway comes into view. It runs from Main Street up a mountain side at an angle of forty degrees, and it is the only public approach to the High Line Railroad station; for that station is a thousand feet above the level of Main Street. Two small cars, counterbalancing each other, and operated by a small power plant at the head of the incline, carry the passengers. "Another of the Colonel's stunts!" grins Baldy.

"See America first!" is getting to be a somewhat trite slogan; but its application has been confined to the picturesque. To men and women, whose blood tingles appreciatively at the sight of what men are doing, the Oquirrh Mountains in their wild, impressive and at some points, awful beauties, and their splendid exposition of gigantic attack, struggle and victory by man over stupendous obstacles—those mountains are a revelation which should change the slogan to "See Americans first!"

REPLANTING DEVASTATED FORESTS

DURING the past year Uncle Sam gathered enough Douglas fir seed to plant 750,000,000 trees. The seed was planted on burned-out tracts of the National reserves that had been devastated by fires in the past three years. Forest fires were unusually destructive during the summer months of 1910 and 1911, despite the large army of rangers constantly on patrol. At least 20,000 acres of the finest timber in the National forests were burned. A very great portion of this was planted to fir seed last fall, and, according to the reports of district forest superintendents, the young trees have sprouted up through the soil. If all goes well they will be full grown firs in twenty-five to forty years.

In order to secure the seed, an especial appeal was made to the boys and girls of Washington and Oregon, where the Douglas fir abounds, for fir cones, and many lads made from two to three dollars per day gathering them. Three methods were followed: First, the cones that squirrels had cut down and dropped were picked up; second, they were taken from standing trees; third, they were gathered from felled trees. The greater quantity was picked up from the ground.

A CAR IN A HURRY

MANY a motor car driver wonders why pedestrians turn to scowl at him as he speeds by on a wet day, for being protected by fenders and wind shield he hardly realizes what a splash he makes as he takes a puddle in the road "on the high." This photograph should prove very instructive to him, showing how the water flies in every direction when a speedy car crosses a shallow depression.

A CAR IN A HURRY.

A BURNED-OFF NATIONAL FOREST WHICH THE GOVERNMENT HAS REPLANTED.

Began Making Guns in 1831.

A VETERAN GUNMAKER

THOMAS RIGGINS was born in 1821, which makes him the oldest gunmaker in the United States. He learned the art of making guns while a boy ten years old, as an apprentice in the shop of one of his relatives. As he grew older he began to make sporting rifles. At the age of twenty-four he could construct a complete rifle from the raw material. The superiority of his work was know for many miles around.

When the war broke out he contracted with the Confederacy to make rifles for the "East Tennessee Squirrel Shooters," a body of volunteer cavalrymen. He was a volunteer in the army, but never saw actual service, as he was asked to instruct about sixty mechanics in the making of cavalry rifles out of old fowling pieces. Many a load of Kentucky flint-lock rifles was collected in the South and sent to Knoxville, where Riggins and his assistants converted them into serviceable short percussion lock, large-bore carbines for confederate cavalry.

The old gunmaker was much averse to posing. His aversion to the operation shows plainly in his expression. He is now confined to his house almost blind, deaf, and in poverty.

Section of Railroad Track Laid on Concrete Ties.

CONCRETE RAILROAD TIE.

It will effect a tremendous saving in cost, as it far outlasts wood. This tie has been in actual use for over four years.

ST. MARY IRRIGATION PROJECT, MONTANA, NEAR THE SITE OF THE PROPOSED EARTH FILL DAM.
The St. Mary River was "swapped" by us in exchange for the use of part of the waters of the Milk River.

SWAPPING RIVERS WITH CANADA

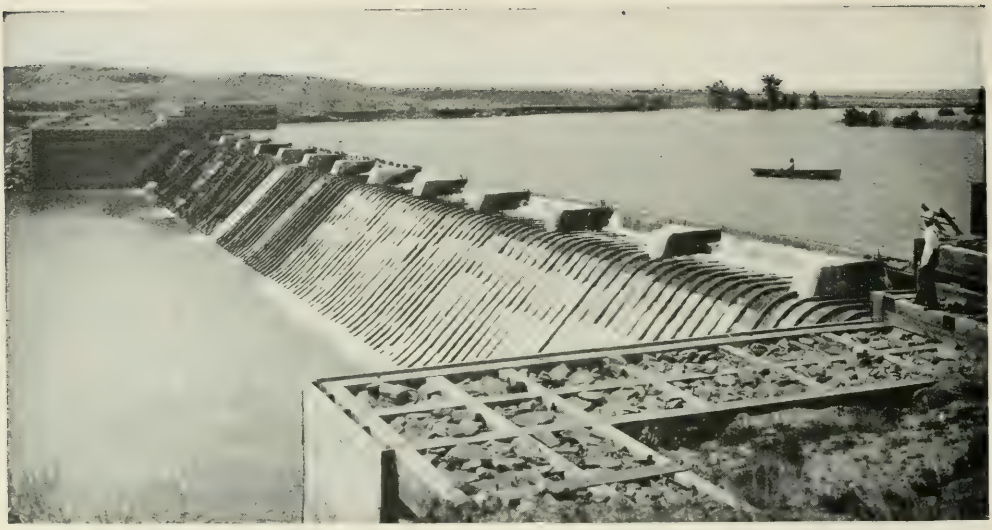
By

C. J. BLANCHARD

THE United States and Canada have concluded negotiations which will result in an exchange of two international streams for the irrigation of lands in both countries.

Up in northern Montana two rivers have their source near the international boundary. One of these, the St. Mary, rises in the lofty snowcapped peaks of the Continental Divide while the other, Milk River, drains the plains area to the east. Both flow northward into Canada, traversing broad and irrigable valleys in that country. The waters of St. Mary River, an important tributary of the Saskatchewan, finally reach Hudson Bay. Milk River, starting in this country, flows for two hundred miles in Canada and then crosses the boundary again to join the Missouri and ultimately to the Gulf of Mexico.

There are no irrigable lands in the valley of the St. Mary in the United States, but there are thousands of acres of such land which this stream can supply in Canada. There are many thousands of acres of choice land in the valley of Milk River both in our own country and in Canada. In fact, Canada could find use for the entire flow of both streams. The lower Milk River valley in Montana has been in cultivation many years longer than the Canadian valley and our citizens have obtained certain rights to the use of the stream which antedate any rights of our northern neighbors. To protect these rights against subsequent appropriation in Canada involves some nice questions of international law. When the Reclamation Act was passed in 1902 surveys were made to determine the physical and hydrographic facts relating to both watersheds. These surveys developed two alternative schemes for utilizing in this country the waters of St. Mary River. First of these was by putting a dam across the outlet of St. Mary Lake and diverting the stored water in a canal cut through the low divide to the east and



ONE OF THE DAMS USED IN THE MILK RIVER IRRIGATION PLAN.

connecting with Cut Bank Creek. By this method the stored waters of St. Mary River would flow southward into Marias River thence east to a junction with the Missouri River near Havre, Montana. This plan while entirely feasible would be extremely expensive.

Plan number two proposed a dam in St. Mary Lake, a canal twenty miles long through the divide to the north fork of Milk River, the use of this river as a carrying canal through Canada, and the ultimate diversion of the flow of both upon two hundred thousand acres of land in Montana in the lower Milk River valley. This plan was not only feasible and practical but it was also much cheaper than the first mentioned.

It had one serious objection, however. If we turned the water of the St. Mary River into the Milk River, what was there to prevent our Canuck brethren from calmly diverting both streams upon their own lands? Possessing as they do a two hundred-mile strip of excellent valley all needing irrigation, it was inconceivable that they would permit the unobstructed flow through Canada. Negotiations were started for a treaty which should fix a method for the division and distribution of the waters of the two rivers and these negotiations were successfully concluded two years ago. While the negotiations were pending actual construction was begun on the St. Mary canal and some important structures were built in the lower valley.

By a recent order of the Secretary of the Interior actual construction of a number of the important features will be taken up immediately and by spring a large force of men and teams will be put to work.

Among the larger and more important structures are the following: Four earth fill storage dams, two of which are on St. Mary Lake. One of these will be fifty-one feet high and twenty-six hundred feet long on the crest, the other forty feet high and twenty-six hundred feet long. A dam at Chain Lake ninety-two feet high and twenty-two hundred feet long, and one at Nelson Lake, thirty-three feet high and fifteen thousand foot crest will also be constructed. The storage capacity of the reservoirs created by them will be 945,990 acre feet, or sufficient to cover that many acres a foot deep.

The lower Milk River valley is made up of a succession of small valleys cut off from each other by low hills. The plans provide for the irrigation of these valleys by means of four low diversion dams each supplying its own canal system. The canal systems will have a total length of approximately five hundred miles. The irrigable area of the project is over two hundred thousand acres.

PERGOLA USED AS A SORT OF PIAZZA.
The pillars are of cream-colored concrete, the cross-pieces are of square-sawed timbers, the flooring of fine brick.

THE RENASCENCE OF THE PERGOLA

By

CHARLES ALMA BYERS

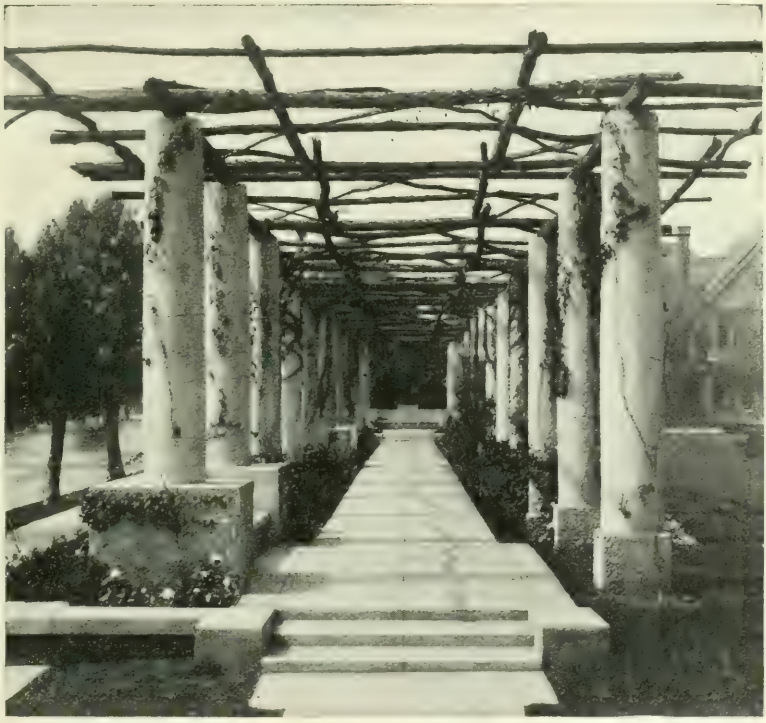
ALTHOUGH in America we have several kinds of pergolas, such as for classification purposes, may be termed partly-roofed piazzas, outdoor lounging retreats, and so forth, the basic idea of a pergola in common usage is that of a semi-sheltered walk. A pergola leading out from the house to a spouting fountain, a tea pavilion, an outdoor rest room, a secluded seat, or some other similar feature of the garden is especially helpful toward making the grounds about the home inviting. When thus employed, it constitutes a sort of corridor of greenery through which one may stroll beneath the festoons of flowers and vines, and breathe, together with the pure, fresh air of the outdoors, a scent of fragrant blossoms, for clinging vines are an essential of the pergola. No matter how graceful or harmonious their proportions, pergola posts and lintels without vines are not sufficiently attractive. Nor to constitute an ideal pergola should the drapery of vines, except in countries where the summers are extremely warm, be too profuse and heavy.

In this country the pergola, whether used to shelter a walk, to create a partly-roofed piazza or to form a lounging pavilion, is variously constructed—some-

GARDEN REST ROOM BUILT AS A PERGOLA.

EFFECTIVE DECORATION OF PATHWAY WITH FLOWERS.

times of poles, of rustic appearance; sometimes of square-sawed timbers, Japanese in effect; occasionally of stone or brick, of simple lines, and often of stucco or concrete, after the style of the old missions, or as a suggestion of old Greek columns. Most often the pillars themselves are of semi-classic lines, but the lintels or crosspieces are of undressed poles, eucalyptus being particularly popular in California. Architecturally, however, the object invariably should be to construct the pergola with the aim of creating a harmonizing link between the house and garden, although it is not always essential that it be of a material identical with that of the house. No other garden feature, in fact, can be so effectively used for this purpose, and the opportunity should not be lost sight of or misused. Many architectural sins have been committed with this charming garden accessory, the builders guilty thereof seeming to fail to comprehend its possibilities as a harmonizer, or, it may be, to possess a real sense of artistic beauty. The pergola is suitable for either the formal or informal garden, but care is required to blend it into either arrangement. Nor should the flooring of the pergola be deprived of the same careful attention. It may be of any one of several materials—cement, brick, tile-flagging or gravel,—but there is always some particular one of these that fits into the scheme just a little better than the others.



PERGOLA OF FORMAL CHARACTER.
The pillars are of concrete; the cross-pieces of eucalyptus; the walk of cement.

VACUUM-CLEANING THE HUMAN BODY

HAVE you taken a vacuum-light bath? The chances are you have not, for this is something new under the scientific sun. This new method is the process of combining the heat rays of an incandescent lamp with a vacuum. Bell-shaped cups of various forms and sizes for applying to various parts of the body are used, an electric light being fitted into the interior. The strength of the suction pull and of the light depends, too, upon the area of the body to be treated. The palm of the hand, of course, will stand greater pressure and more heat than will the face. The action of the suction cup alone is two-fold: it draws from the skin impurities characteristic of certain not uncommon skin diseases; and furthermore, it draws the blood to the surface, the blood picks up waste matter that the suction does not get and carries them to the various excretory organs, such as the liver, kidneys, and lungs, where in one form and another they are eliminated from the body. It also brings to the diseased part substances for building up new tissue and healing the wound. The circulation of the blood in the diseased areas is especially stimulated by successively applying and withdrawing the suction cup.

In addition to the effects of suction the remarkably stimulating effects of heat are introduced. The small lamp within the cup dilates the blood-vessels which lie near the surface of the body, allowing a greater volume of blood to reach the affected part, and also accelerating the flow of the blood stream. The heat rays find the skin in an especially receptive condition, for the suction opens the pores of the skin in a remarkable manner; and the push of the body surface toward the lump serves to drive the rays into the interior of the skin.

COMBINATION OF VACUUM AND LIGHT IS USED WITH GOOD RESULTS IN THE TREATMENT OF BALDNESS.

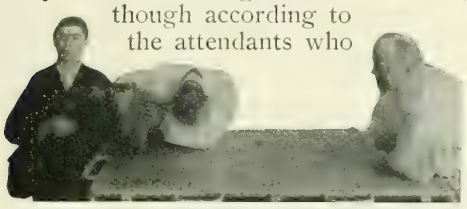
BONES PARK AT MANILA.

HUMAN BONES AS PLAYTHINGS

THERE seems to be a curious irreverence among the people of the tropics and the semi-tropical regions for the remains, if not for the memory of the dead. This of course holds true almost solely with the semi-civilized or illiterate portions of the people. The way the bones of the dead had been heaped about in piles outside of the city of Havana at the time of the occupation by American troops, at the close of the long period of insurrection, strife and cruelty in the island of Cuba, is a matter that was not soon to be forgotten. Now, in the city of Manila a similar condition of affairs—in one place at least—prevails. The place under consideration is known as the "Bones Park," and indeed this park is well named, for the plot of ground is literally covered with human bones. Among leaves, partly hidden sometimes by trailing vines, they lie, bleaching in ill-considered neglect. To the youngsters shown in the illustration, however, there is evidently nothing gruesome or horrifying about this. They sit there, holding skulls and "cross bones" in their hands as if it was the most natural thing in the world for children everywhere to indulge in this unusual form of amusement.

HOSPITAL FOR ANIMALS

THE quality of mercy surely is not strained when it includes in its operations even the animals in the street—the outcast felines and canines of a great city. In Berlin there is a hospital that looks solely after suffering dumb creatures, though according to the attendants who occasionally have to handle obstreperous cases, some of these creatures are far from dumb. The institution is connected with a prominent veterinary college located in the German capital, and hence this may account in part for the solicitude shown for these unfortunate creatures. Be that as it may, however, excellent medical and surgical service is given sick and maimed animals, as a result. The illustration shows a somewhat unusual case—that of a monkey, whose lungs are being tested for tuberculosis. The physicians go about their task with all the gravity of high-priced specialists called in to consult over the illness of a multi-millionaire. This little ape belongs to the Italian standing at the monkey's side. The little creature's illness is indeed a very serious affair to the poor fellow, for it is with the aid of this amusing denizen of the jungle that he ekes out his living as an itinerant fiddler.



EXAMINING A MONKEY FOR TUBERCULOSIS.

ELECTRIC VENTILATOR FOR PHONE BOOTH

THE accompanying illustration shows a unique electrically driven ventilator for use in telephone booths, as designed and constructed at Hyde Park, Massachusetts. It seems surprising that the high-class hotels and clubs, which are so careful about the ventilation and cleanliness of other parts of their building, allow guests to suffer the disagreeableness of hot, close telephone booths.

The photograph itself is very nearly self-explanatory. The ventilating set, which runs almost noiselessly, blows fresh air to one or more booths through diffusers which make the flow of air positive but gentle. The air thus forced into the closed booth is let out by a device that does not permit sound to escape into the adjoining booths.

There are slide gates placed, one in the bottom of the inside walls, the other in the top of the outside wall. The foul air is forced through the ventilator into the dead air space, where its velocity is changed. It then flows out through the ventilator at the top of the outside wall. This changing of the velocity and direction of the outgoing air breaks up sound-waves and entirely eliminates the transmission of sound with the air. With booths equipped with in-swinging doors, there is ample leakage for the foul air to pass out.

Thorough insulation makes the operation of the set almost noiseless, so that practically all its apparent disadvantages are done away with.

HERE'S A PHONE BOOTH WHERE THE AIR IS FRESH.

SUNDIAL MADE BY BOY

A LAD who was anxious to make his mother a birthday remembrance, picked out the most attractive rocks from a stone pile, and reared a pedestal to be used later as a foundation for a sun dial, in the garden.

In order to make the foundation firm, he mixed mortar and cemented the rocks together. The dial itself he purchased for one dollar and fifty cents. It is brass and in addition to the gnomet and the figures, has the usual legend: "I mark none but pleasant hours." A vine was transplanted from the big porch creeper, and in a few days it began to put out its little feelers in the stone crevices. By another season it will be covered.

One Dollar and Fifty Cent Sundial Mounted on a Stone Base.

BANANA TREE BEARS FRUIT IN MARYLAND

ON the lawn at Mt. Olivet cemetery, Frederick, Md., there grew the past season an Abyssinian banana tree, something unusual outside a conservatory or the tropics. This species of banana grows from seed. When young it resembles an elephant plant, except that it grows much taller and the leaves are much longer and not so wide as those of the elephant ear. The bananas are encased in wrappings of leaves, which, as the fruit develops, fall away. This enveloped bunch resembles an immense ear of corn. After the tree produces one bunch of bananas it dies. In order to grow new trees fresh seed must be planted. A number of bananas have been removed from the bunch on this tree.

Banana Tree Thrives in Northern Clime.

FORMERLY A FLOURISHING TOWN WITH A POPULATION OF 1500 NOW VIRTUALLY ABANDONED.
Coram, Cal., where the deadly gas generated by the smelters forced the owners to shut down the plant.

TURNING GAS FUMES TO PROFIT

By

A. H. MARTIN

SINCE copper became a staple of commerce its production has become one of the most important of earth's industries. Immense expenditures of capital have been made to bring the red metal from its rocky citadels into the marts of the world, and with its coming the goddess Electricity has gained dominion over sea and land and the high heavens. But in smelting the ore a terrible engine of destruction has often been set loose—a diabolical agent that time and again has paralyzed the very industry giving it birth. Ever bent on a mission of destruction, spreading its devastating veil over fruitful vales and orchards, turning prosperous towns into deserted barrens—such is sulphur dioxide—the deadly gas that has defied the resources of the brightest minds of science.

The assistance of the law has been invoked and costly smelters and rich mines closed. Millions of capital have been rendered useless, smelting towns have been abandoned, even the farmer has suffered, for the closing of gigantic mines means the end of a profitable market for agricultural products. Between the agricultural and mining interests has developed an antagonism which is working harm to both.

The greatest battles against sulphur dioxide gas have been fought in fertile California, where miners and farmers are traditional enemies. But nearly all the copper States have been affected to a more or less extent. Inventors have racked their brains for devices to counteract the deadly properties of the vapor, and at times it seemed as though the skill of man would prevail, but all hopes were disappointed.

At the smelter of a chemical company near Campo Seco, California, the terrible vapor is being fought along new lines. Representatives of the big smelter concerns have been interested observers.

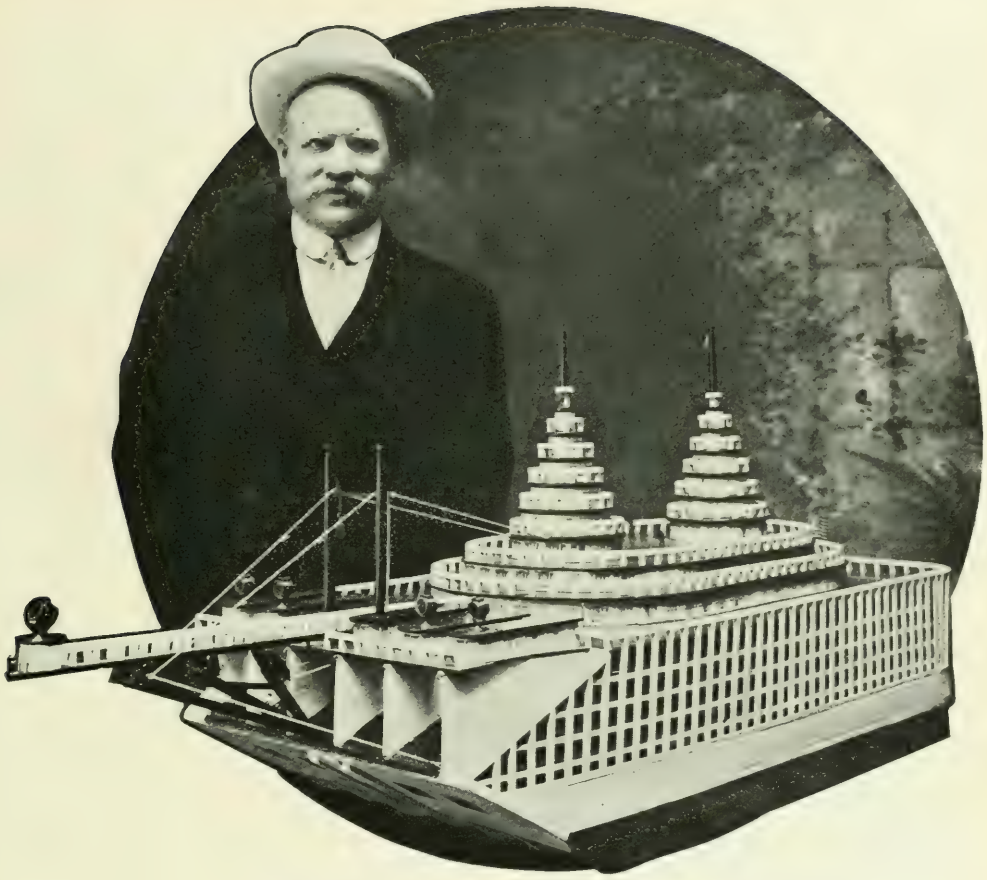
A BIG SMELTER PLANT AT KENNETT, CAL.
The greatest battles against sulphur dioxide gas have been fought in fertile California.

Preliminary tests have been highly encouraging and at last it seems as if the defiant gas must acknowledge a master.

It has long been known that when sulphur dioxide gas is united with vaporized oil and passed over heated sulphide of lime, to which a small amount of iron salts have been added, its structure is shattered and the copper contents released. By cooling, this may be later condensed into the yellow sulphur of commerce. This process is the invention of Dr. S. W. Young, professor of physical chemistry at Leland Stanford, Jr. University. In this process the carbon required for coalition with the gas is generated by volatilizing crude oil and the united product brought in contact with calcium sulphide.

The crude petroleum is pumped into a combustion chamber and vaporized by steam injected burners, a constant temperature of about 800 degrees C. being maintained. The sulphur dioxide is driven through a flue to the chamber and calcium sulphide employed as a catalytic agent. The combustion chamber and reaction compartment are composed of brick checker-work. The spaces in the reaction chamber are nearly filled with a mixture of equal portions of plaster-of-paris and sawdust, dampened with water to which a small quantity of iron salts have been added. The available spaces are filled with small lumps of the calcium sulphide. From this chamber the liberated sulphur passes in the form of vapor to the iron condensers. Water sprays cool to the desired temperature and the mineral is precipitated in yellow sulphur form.

As arsenic, celenium and other minerals are frequently associated with the sulphur in furnace gases, it is necessary to prevent the passage of these with the sulphur. This is accomplished by employing a long, low, broad, slightly inclined condensing chamber and cooling the gas with sprays of water. The more volatile sulphur vapor readily escapes to the condensers while the arsenic and other minerals are arrested. Thus an absolutely pure sulphur is now available for market. It is planned to turn the destructive sulphur into a valuable asset. Practically all sulphur consumed in America comes from the sulphur wells of Louisiana and the natural deposits of Mexico, Sicily and Japan. That a good market awaits the smelter product is certain.



N. A. LYBECK AND HIS OCEAN FERRYBOAT.

INVENTS UNSINKABLE CRAFT

By

H. P. MEADOWS

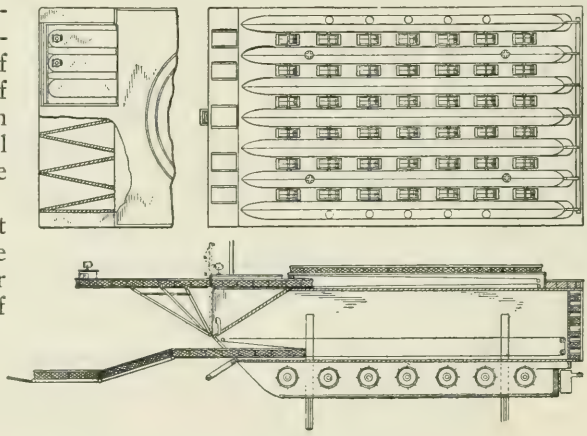
THE idea for an ocean ferryboat, which its inventor, N. A. Lybeck, of New York City, claims is absolutely disaster proof, has been put into model form.

In describing his vessel Mr. Lybeck says: "Such a vessel must not carry boilers lest they explode; it must be unsinkable, fast, clean, comfortable and must not cause seasickness. In order to avoid all strain, vibration or motion of the vessel it must be built large enough to create for itself a level place on the surface of the ocean, and it can be done by means of a multiple of hulls rigidly braced and securely held together as one, and all the structure above the bare hulls built as one boat.

"Suppose the length of the boat is one thousand five hundred feet and the width one thousand feet, with a space of thirty feet between each hull. The waves can only pound on the outside of the two outer hulls, but cannot lift the hulls or cause them to rise and fall with them.

A vessel one thousand feet wide and two hundred feet high would appear to be a great obstruction to force against the wind. This can be overcome by a wave leveler that extends and forms a wall the width of the vessel. This begins six feet above the water, and, with openings for the water to pass through, extends upward and forward to the center of the height, where it will run backward and upward to the top, making a sharp horizontal prow. Perpendicular prows standing out from and above the horizontal prow, following the lines of the hulls below, of which they are an extension, still farther reduce the wind pressure.

"Traveling at great speed, the wave leveler pushes the tops of the waves into the hollows, and the sea back of it becomes level. It is held so by the weight of the vessel in passing.



As the Boat Appears in Diagram, from Above and at Side.

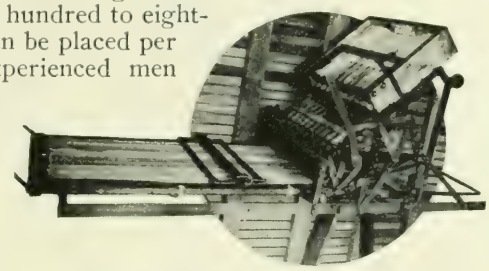
'Such a vessel will necessarily be very heavy, but its carrying capacity will be much greater in proportion to any other vessel. It will be unsinkable. In a collision with an iceberg the water leveler would cause it to ride over or to push down the berg. Searchlights and other contrivances could be used to avoid collisions. The quick launching of lifeboats is provided for. They would be shot into the water one a minute from conveyors running from the decks down to the water. Four vessels of this type would carry all freight and passengers between New York and England. The cost of construction and operation would be immense, but one such vessel would earn enough to pay for itself each year."

A feature of the proposed craft is propulsion by oil-burning engines, possibly of the Diesel internal combustion type. Power is to be distributed over the entire bottom through large paddle wheels between the parallel hulls. Provision is made for 360 of these driving wheels, each of them to consist of an air-tight drum with eight blades, and in case of accident to any or all of the hulls, the drums would be able to keep the craft afloat. There are also eight screw propellers with a side thrust along the sides to aid in steering the massive craft. The lookout is stationed on a movable bridge, which can be extended two hundred feet in advance of the bow.

"There are no docks at present that I know of that could receive this vessel," said Mr. Lybeck. "However, a ferry slip the width and length of the vessel would be all that would be required. The wharves and slips could be made of cement, and need be only a few inches wider than the ship. There need be no unsightly posts or cables, as the vessel's own vertical anchors would hold it steadily in place." These vertical anchors are large steel tubes reinforced with collateral ribs, which project into the ground through apertures in the bottom of the vessel. They are never visible.

MACHINE TO NAIL LATHS

A MINISTER of the gospel in a Michigan city has invented a lath nailing machine which promises to fill a long felt want in the building world. With it from twelve hundred to eighteen hundred laths can be placed per day, and four inexperienced men can do more work with one machine than the same number of experts by the old method, after two days' practice with the machine.



THE MACHINE READY TO LAY LATHS.

To operate, the holder is filled with a full break of lath, ten in a break, which are butted against a straight edge. A lever locks and spaces the lath properly. The break, caught by the holder near the center, is then ready for the machine, which is placed on a carriage. By a single movement of the lever ten nails are dropped and pressed into the lath. By repeating this operation four times, all the nails are set in place. This operation takes from five to ten seconds, only.

The mechanism employed in feeding the nails in the machine to the lath from the time they are tripped from their magazine running into their proper channels until they are pressed into the lath is most ingenious.

UNUSUAL METHOD OF RECORDING AN ECLIPSE.

NEW WAY OF RECORDING ECLIPSE

THE accompanying illustration shows the apparatus and method employed recently in recording an eclipse of the sun with selenium, by M. Ancel, at Paris. On account of the fact that more or less current will pass through a selenium cell according to the amount of light falling upon it, Ancel applied the idea by throwing the sun's rays upon a very sensitive cell and measuring the effect of the light by recording electrical instruments.

The experiment was made with success in the suburbs of Paris, where he had erected a shelter in the fields. In front was a mirror which moved by clockwork, so that it followed the sun exactly and kept its light thrown upon the selenium cell, this being placed on a table. Within was placed the electric recording apparatus and batteries. The recorder operated upon a moving paper band and traced a line showing

BY A SINGLE MOVEMENT OF THE LEVER TEN NAILS ARE DROPPED AND PRESSED INTO THE LATH.

the strength of the light and producing a curve with time and current or swing of galvanometer indicated on the diagram.

A heliostat kept the sun's rays on the selenium cells, a mirror galvanometer recording the curve on a paper drum. A battery of four volts was used with an ordinary milliamperemeter, of the direct reading type. The galvanometer has two small mirrors both arranged with Nernst lamps and slots, one mirror being used for indicating a point on the usual scale and the other for the photographic registering of the curve on the bromide paper on the drum.

The apparatus commenced registering at 10:45 A. M. continuing during the eclipse and stopping at 2:50 P. M. The curve recorded was very good and shows perfectly how the light lessens during the eclipse and then increases again to the original point.

MAN-POWER MOTOR BOAT

THE accompanying pictures show a home made motor-boat, the work of a farmer boy in Wisconsin. The materials are discarded machinery parts, such as accumulate on almost every farm.

The hull is made with keel and has wide, closely spaced ribs, like those of a birch-bark canoe, and is covered with canvas. The motive power is the strong

WHERE THE MAN-POWER IS APPLIED.

back of the farmer boy, applied through a contrivance made from a worn out washing-machine. The lever is pushed backward and forward, rotating the bell-crank shown at the right of the second picture. The fore and aft arm of the bell-crank carries a number of rollers, which serve as gear-teeth and engage a pinion on the end of the propeller shaft. At the end of the forward stroke of the lever this arm is raised by a spring, and the rollers which have been below the pinion are shifted to the top, and on the return stroke maintain the same direction of rotation. A second spring at the end of this stroke drops the arm of the bell-crank to its position below the pinion. The connecting rod seen in the picture has a hooked bar at the end, which may be set in either of two holes at different distances from the center of rotation, giving the equivalent of a high and low

BOAT EQUIPPED WITH INGENIOUS MAN-POWER MOTOR.

REMARKABLE FLAT ARCH IN PANAMA THAT AN AMERICAN CONTRACTOR REMOVED.

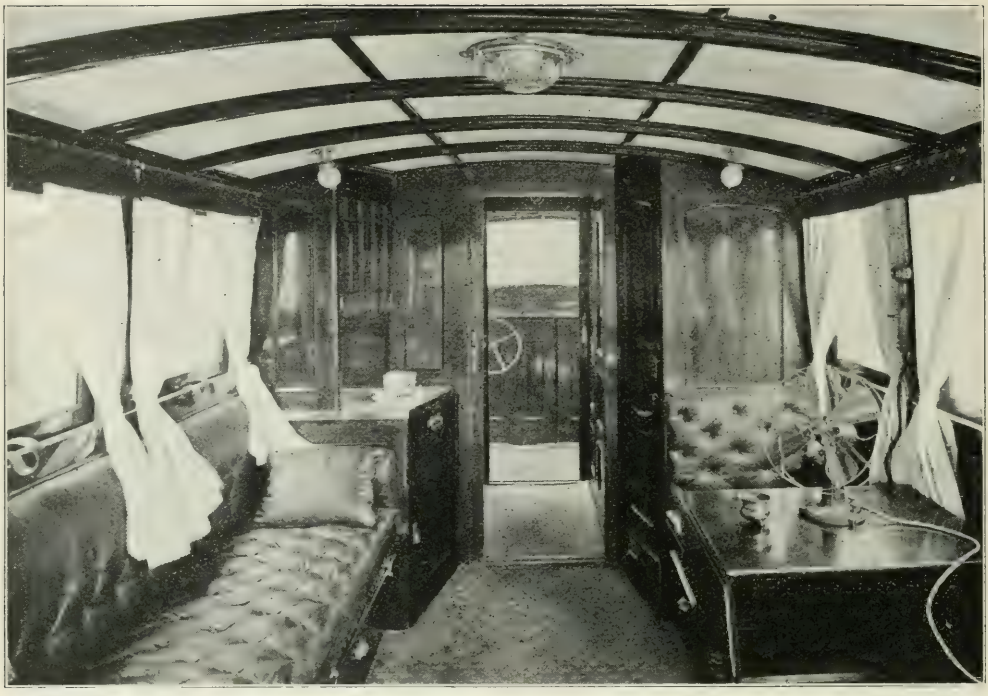
gear. The stuffing box on the propeller shaft, seen under the seat, is simply a bored hole, stuffed with rags and grease wedged in place by nails. The propeller, which lies in front of the boat in the first view, is made from a binder sprocket-wheel, with sheet iron blades crudely riveted on. The rudder is beneath the stern, and the rudder post passes through another stuffing-box. The boy also does the steering with his right foot, thrust through a tin loop.

FLAT ARCH OF PANAMA

ONE of the architectural wonders of the world, the famous flat arch in the church of San Domingo in the city of Panama, was recently destroyed. The historic ruin was razed to the ground in order to make room for the construction of a modern apartment house on the site where for many years the natives went to pray. Some agitation was started in an effort to save the sacred old arch, but action was always deferred until *manana* (tomorrow) as is the Central American custom, and as the work of destruction was in the hands of an American contractor the ruin had disappeared before its saviors got started.

The church of San Domingo was over two hundred years old, having been built by the monks soon after the old city of Panama was sacked and destroyed by the bloodthirsty and avaricious pirate, Henry Morgan. It was a structure of many arches containing six grand and twenty small arches. For years it has been roofless and gradually weathering away under the tropical sun and rains. The natives have used it for a dwelling place, wash yard and market. At one time it was occupied by a blacksmith's shop, a vegetable vendor, and three families who did an extensive hand laundry business, judging from the number of garments of all descriptions that were spread about to dry in the sun.

Material progress is hard-pressing on the heels of sentiment today. What is not valuable in terms of money must go —and go quickly.



THE CABIN OF THE *ELLEN*.

GERMAN ELECTRIC LAUNCHES

A NUMBER of electric house boats and launches, in service on German waters, are of special interest on account of their complete equipment with various labor-saving electric devices, including electric fans, electric heating and cooking apparatus and electric motor driven devices for use in the kitchen and pantry. This boat is equipped with electrically-driven propellers, the motors having a normal capacity of three horse power, at one hundred revolutions per minute, and seven horse power each, under maximum load, at one hundred and twenty-five revolutions per minute, the current being supplied by a storage battery plant of one hundred and sixty volts.

GERMAN HOUSE BOAT EQUIPPED WITH ELECTRICALLY-DRIVEN PROPELLERS.
It is called the *Sommernachtstraum*.

A gasoline engine generator set is provided for charging the storage battery of this outfit and may be operated in parallel with the battery during heavy load at high speed, if found desirable. An electro-magnetic coupling is provided between this set and the propeller motor, so that both the electric motor and dynamo may be used for driving the propellers, both acting as motors. The gasoline engine operates at the same time to add its power to that of the electric machine working from the storage battery.

The electric motor yacht *Ellen* is seen in one of the illustrations, an interior view of the cabin being shown. It is equipped with electric lights, electric fan motor and electric cigar lighter, and with other unique devices, also, for the comfort of the owner and his guests.

The current for operating the electric cooking apparatus, including the electric heaters, is supplied from the storage battery installation used for driving the motors operating the propellers of the boat.

WHERE WOMEN WILL BE TAUGHT BRICK-LAYING, CARPENTRY, PLUMBING AND OTHER TRADES.

TRAINING WOMEN TO MANUAL LABOR

By

CHARLES FREDERICK CARTER

BY the opening of the Johnson Female Trade School to teach able-bodied young women bricklaying, carpentry, plumbing and all the other building trades the millennium has been brought appreciably nearer. Already the time is almost in sight when women will do all the hard work, leaving to men only the less exhausting tasks of talking politics and playing pinochle.

If the truth must be told, though, the establishment of this new departure in trade schools is the first indication that America is seriously trying to catch up with the rest of the world. Europe has long had lady street sweepers, lady bartenders, lady bootblacks and lady farmers. In Jamaica, a British possession, lady hod carriers may also be found. As for Japan, no tourist would think of returning from thence without a photograph of the lady coal heavers coaling the steamer on which he was a passenger. Still, New York City does fairly well. Most of the office work in the metropolis is done by women. A stranger who happened to be near one of the great skyscrapers at quitting time might be pardoned for thinking he had stumbled on a young ladies' seminary. Women by the thousand swarm through the streets in the business district to the elevated railway and subway stations morning and evening with only here and there a shrinking young man pursuing his modest way. The "Hen Walk," a ground floor hall a block long, where the hundreds of young women employed in a Twenty-third Street building promenade during the noon hour, is one of the sights of the city.

But to return to the Johnson Female Trade School, so named in honor of the fire commissioner of New York, who has done a few things to boom business in the building line. Oh, it's no joke! Ground for the school building was actually broken last July at Woodside, Long Island, where the Pennsylvania Railroad, after burrowing under the Hudson River, New York City and the East River, comes up for air. Before the first sod was turned no fewer than thirty-six young women had signified their desire to pay the annual tuition of three hundred dollars a year for two years for the privilege of learning how to handle the trowel, the jack plane or the adding machine which, as every one knows, is the plumber's principal tool.

The principal is to be Edward L. Middleton, a young civil engineer, who has specialized in building construction. He is to have a staff of six instructors. He

will not have the slightest trouble in finding the six. Nobody could possibly believe how popular the idea of teaching a select class of young women, or rather a class of select young women, really is without seeing the stacks of applications that are pouring into the offices of the Johnson Female Trade School.

The school building, which is to be two stories high, will cover half a lot one hundred feet square. In its eight class rooms the students will learn theories of the various trades, for a while, then they will go out into the school yard where they will construct a building complete to the last detail with their own fair hands, then tear it down so they can do it all over again.

The idea of the Johnson Female Trade School, the first institution of its kind on the western hemisphere, is credited to Thomas J. Buckley, President of the Master Builders' Association, an organization consisting of some sixty builders who specialize in municipal building in New York City. While in Europe in the summer of 1911 he heard of a school in Berlin where women were taught the various building trades. Taking the first and fastest train to Berlin Mr. Buckley hunted up the school. He found an institution in which two hundred young women students were learning how to put up buildings under the direction of a staff of thirty instructors. They did not stop with the memorizing of lessons from text books. No, indeed; they tucked up the sleeves of their bloomer costumes, grasped trowels, laid bricks and yelled "Mort!" or the German equivalent therefor when the hod-carrier went to sleep on her job just like a veteran journeyman. That the school has been a success may be gathered from the fact that Berlin now has some forty-six women building contractors. Some of the largest and handsomest buildings in the German capital have been erected by women builders.

THOMAS J. BUCKLEY, PRESIDENT OF THE JOHNSON FEMALE TRADE SCHOOL.

The more he investigated the more enthusiastic Mr. Buckley became. Upon returning to New York he had much to say about the school to teach women the building trades. Among those to whom he talked was a society woman who volunteered to give $5,000 toward a fund of $50,000 to establish a similar school in New York on condition that her name should not be made public. Such a condition was not long permitted to stand in the way of this opening contribution.

Then Mrs. Sidney A. Williams, a bride of last spring, gave another $10,000, then started with her husband for Berlin to see the original school. Next a distinguished suffragette, who like the first donor, prefers to remain unknown, gave another $10,000. While other subscriptions were coming in the Master Builders Association agreed to guarantee the remaining $25,000 so that work might proceed.

Should the sweet girl graduates of this new departure school not care to follow their trades they may be able to find office jobs where their practical training will come in handy. The builder must of necessity put his financial life in the hands of his estimator. Naturally competent estimators command fair wages—say from $50 to $100 a week. But why pay a man fifty dollars a week to do work that a woman will do for half that sum?

APPLYING THE DIATHERMIC TREATMENT TO A PATIENT FOR HEADACHE.

NEW WAY TO HEAT HUMAN INTERIORS

By

T. C. O'DONNELL

EVERY physician who has made wide use of heat in the treatment of disease has encountered the perplexing and hitherto unsolved problem of how to localize heat at any point desired in the interior of the body. He is able to give sweating baths for colds, hot and cold packs for the same affliction in case of juveniles—did ever juvenile escape them?—hot and cold fomentations for sore throat, and even electrical treatments for curing eczema and skin diseases. The difficulty all along has been to get the heat inside the body at the precise point of the pain. Supposing, for instance, your head ached. Now the first thing to do with the old methods of heat application is to apply the heat—to the rest of the body, and not to the head; the thing for the head was an ice-bag, for this *drove* the blood away from the head, while the heat at the feet, say, *drew* it away. It was a practical demonstration of "push" and "pull" in team work. The great object sought was to get the blood out of the head by any and all means.

The principle worked well after a fashion, but its effectiveness was limited by the fact that you cannot get all the blood out of the head; and anyway, if you did the nerve irritation would not be wholly removed. To relieve irritation of the nerve, physicians for a long time sought for some means of getting the soothing effects of heat to the one place where they were needed, and that was where the irritation lay.

Doctor Nagelschmidt, a German savant of wide repute, has now devised an apparatus that secures this end in a very satisfactory manner. The current—an alter-

nating current—is applied by means of electrodes placed at points opposite the seat of pain. In case of headache, for instance, the positive electrode is applied on one side of the head, say above the ear, the other at the side of the head opposite, so placed that a straight line running from the one to the other would penetrate the region of pain. This is not a difficult matter, as the physician after diagnosing the case can easily locate the seat of irritation and so adjust the electrodes as to get the painful part in the path of the current. If, for example, a gouty toe is to be treated—and the apparatus treats gout with remarkable effectiveness—the obvious points at which to apply the electrodes are the upper and lower sides of the toe, and not the toe and the instep.

A more difficult problem is to localize, or focus, the heat between the poles at the right spot, and that is what "diathermy," as Doctor Nagelschmidt's method is called—the word coming from Greek equivalents for "through" or "into" and "heat," or heat that goes through or into —accomplishes. A demonstration of this focusing quality of the diathermic apparatus, for instance, shows that when the current is made to pass through egg-white the albumen of the egg is not affected whatever at the electrodes, but at the focusing point it is cooked. This point of focus may or may not be at equal distances from the electrodes; proper manipulation of the electrodes determines all that.

The current alternates at the remarkable rate of three million times per second, the strength of the current reaching, when desired, the still more remarkable figure of three thousand mille amperes—one hundred times the amount of "juice" used by most electro-therapeutic devices.

Diathermy is not a panacea. There are a whole lot of diseases that it will not cure, but in headaches of every kind—and heaven knows there are a host of them!—it is making good in an ample manner, as also in relieving neuralgic and sciatic pains, rheumatism, gout, gastritis, and hardening of the blood-vessels in the brain and region of the abdomen. It also relieves the sharp pains so characteristic of locomotor ataxia, and has been used to good purpose in pleurisy, tic douloureux, and in several eye and ear affections. Even the labored breathing of asthma has yielded to diathermic applications.

FOUR MILE AERIAL TRAM

A RATHER unique application of the expression: "One hand shaking another" is demonstrated in the aerial tram located at the Highland Bay Mine of Bingham, Utah.

The tram, which is four miles in length is utilized in carrying the crushed ore down the side of a mountain. A 100 horsepower motor of a standard make is used to start the cable system in motion. Once it has gained momentum, through the weight of the buckets, the current is shut off from the motor and it delivers current as a generator for use in the smelter and for other purposes.

TO HUNT LIONS IN LONDON

AGITATION has been raised against a scheme of lion hunting in London, through the papers, due to the fact that an erroneous report was circulated that there was going to be a "shooting of lions in London," whereas, as a matter of fact, it is not "shooting of lions" but hunting and capturing lions in London, that is intended.

A club is being formed, the initiation fee of which is one hundred guineas—$500—which entitles the members to participate (at their own risk) in the hunting and capturing of lions. Each member of the club is entitled to invite five persons at a fee of five guineas and for

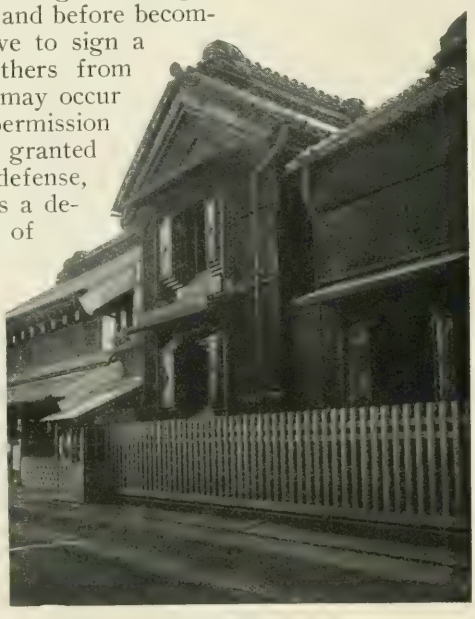
FOUR MILE TRAM LINE AT BINGHAM, UTAH.

WHERE THE SPECTATORS WILL OCCUPY THE CAGES—A LION HUNT IN LONDON.

their safety a number of cages will be dispersed around the enclosure, where they can sit in perfect safety and watch the event. It has been thoroughly explained to the various participants that there is an element of great danger attached to this thing, and before becoming members they have to sign a document relieving others from all responsibility that may occur as a result thereof, permission for shooting being granted only in case of self-defense, when an animal makes a deliberate attack on any of the hunters, in which case they have the right to the use of their rifles, but not otherwise.

It will be a very select affair and the cost of transforming the immense Stadium to this special use, will be exceptionally heavy, hence the fee in question. Already very large offers have come in for the cinematograph rights.

Our picture shows the arena at the Stadium as it will be when completed for the hunt.



FIREPROOF STOREHOUSE AT TOKIO, JAPAN.

TO PROTECT AGAINST FIRES

AMERICAN and European merchants doing business in the cities of Yokohama and Tokio find that they cannot house their goods under conditions of security similar to those to be found in their native lands, for the reason that these important centers of Japanese life are likely to be devastated at almost any time by terrific

conflagrations. These fires are of course due to the inflammable character of the homes and stores, they being constructed of bamboo or other light material. In order, therefore, that they may have some protection against this ever possible disaster these foreigners in the far East have built fireproof structures of the sort to be seen in the accompanying illustration.

CURIOUSLY PAINTED HOUSE IN THE AUSTRIAN TYROL.

Dwellings so decorated are found all over the Tyrol. These paintings usually represent historical and religious scenes. In this illustration are represented the progress of the individual life—boyhood sports, youth, courtship, daily labors, middle and old age, and, finally, death.

It will be noted that the walls are covered with sheet iron, that the windows have very substantial steel shutters, and that the roofs are well tiled. Moreover, these same shrewd aliens are taking no chances when it comes to guarding themselves against thieves. Of course the fireproofing mentioned above serves for this purpose. In addition the sloping roof is protected.

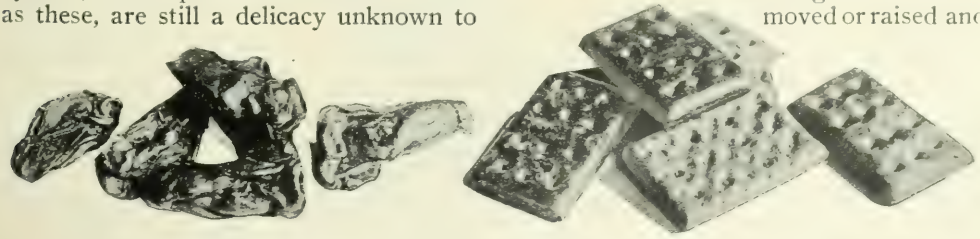
RAISING A TWELVE-FLAT BUILDING FULL OF TENANTS.

DRIED OYSTERS FOR FOOD

BIRD'S nest soup, shark's fin, and rice worms are perhaps the strangest foods known among the Chinese. Dried oysters, if not quite so outlandish a food as these, are still a delicacy unknown to Americans. One does not have a proper conception of how "meaty" the oyster can be until he has seen it in its dried state. He will then have more respect for the solidity of the bivalve. Ten or twelve of the dried oysters, with a fair quantity of bread, will make an average — indeed a square — meal. There is no mysterious or elaborate details in the process of drying. The oysters are first thoroughly soaked in brine, and then exposed to the rays of the sun. According as the epicure wishes, the product can be eaten either dried or cooked. The black tea crackers samples of which are also shown in the accompanying illustration, go fairly well with the sun-dried oysters. They are black all the way through and fetch in the market about a dollar and a half a pound.

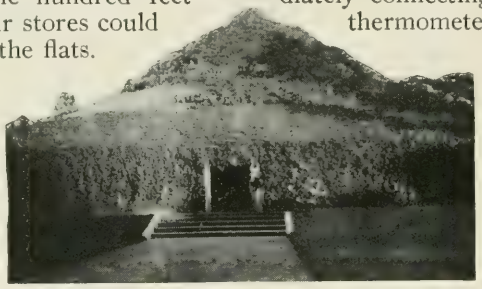
RAISING A TWELVE-FLAT BUILDING

IT seems no job is too hard for the Chicago house-mover. If the owner of a building wants it removed or raised and



DRIED OYSTERS AND BLACK TEA CRACKERS AS DELICACIES.

can pay the bill, the work will be done, no matter how large the building or how much stone and iron is used in its composition. This twelve-flat building with a front of nearly one hundred feet was raised so that four stores could be constructed under the flats. While this work was in progress, the twelve flats were continuously occupied by the tenants, who experienced no inconvenience whatever.



The Reverse of the Hot House—the Cold House.

The work of cutting the building from the foundation and inserting heavy beams and iron rails is the first work done and when the jackscrews are all in places, of which there are hundreds, the building is then gradually raised inch by inch by the men, each man turning a few jacks when the superintendent blows his whistle. So exact is the process that the brick work is not even cracked.

COLD HOUSE FOR PLANTS

WE of the north temperate zone have our hot houses in which we nurture those plants which are unable to stand the sometimes frigid temperature of our clime. Calcutta, India, has a very curious reverse of this custom. In the public botanical gardens there is what may most aptly be called a "cold" house, where plants from the less torrid regions are kept, in order that they may flourish as they are wont to do in their native environment. Calcutta's botanical gardens contained, even thirty years ago, a fine collection of plants from both the northern and southern hemispheres. American cities do not boast of anything exactly resembling this cold house. Our substitutes for it in any extensive nursery are a series of rooms or chambers in the hot house, each of which is heated to a special temperature, according to the species of plants that are to be placed therein. Thus, one chamber may be at a temperature of sixty-eight degrees and the chamber immediately connecting may record on its thermometer eighty degrees.

In this way the botanist may study, simply by passing from room to room, the flora of every clime, from that of the tropical to the mosses and lichens of the sub-arctic.

CARRY-ALL AS TRAVELER'S HOME

IN the old carry-all herewith pictured, an agent of the Massachusetts Bible Society makes his year-round home. He travels some five thousand miles in a year, or about one hundred miles a week, selling or giving away bible tracts and sacred picture cards.

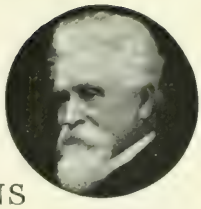
As the country through which he travels is an inhospitable one, and its people averse to entertaining "angels unawares," this clever colporteur fitted up his old equipage for living purposes. His Gospel literature is stored in the front of the vehicle. This consists of bibles printed in nineteen languages, and tracts in every known tongue.

The old horse that draws the vehicle knows his business by heart, and when on the road permits his master to sleep when tired. In fact, the horse jogs along faithfully, without guidance, turning out for vehicles as well as if his master were at his post.

Through all the remote counties in the western hill country the colporteur and his ingenious home-on-wheels are well known and welcome. It is estimated that he has distributed more than fifty tons of Bibles and other religious literature during the past five years.

Carry-all as Traveler's Home.

LONGER EARS FOR OCEAN GREYHOUNDS



By

P. H. MIDDLETON and F. C. PERKINS

ELIAS E. RIES.

SIR HIRAM S. MAXIM.

THE tragedy of the *Titanic* will never be repeated, if the invention of either Elias E. Ries, a well known New York electrical engineer, or of Sir Hiram Maxim, the celebrated English inventor, is adopted. Put in a nutshell, Mr. Ries proposes to equip our ocean greyhounds with longer ears, the human ears being rendered a thousandfold more sensitive to atmospheric sound waves by means of a simple, scientifically accurate, mechanical expedient, just as the eyes are rendered a thousandfold more acute by the use of a simple microscope, while Sir Hiram Maxim's device bears in its working, a close analogy to a peculiar instinct of the bat.

Mr. Ries thus describes his invention: "Man is provided with two eyes and two ears. It is well known that the eyes at close range see objects in stereoscopic relief, and in the distance they merge into a flat surface. A one-eyed man can only see objects in the flat, without depth. Now the ears operate in precisely the same manner. Direction can be obtained by one ear alone, that is, the right or the left ear can hear sounds coming from the right or the left, but in order to obtain any idea of position or source of sound both ears must be utilized, that is, the head must be turned in the direction of the sound so that the breast of any given sound wave will strike both ears simultaneously. If the sound is not too distant the ears are sufficiently sensitive to permit one to detect the approximate direction. But the distance of the sound is not ascertainable by the ears unless its character is known.

"My invention utilizes the earth's atmosphere to do the bidding of man. The device consists of a long range, electro-pneumatic siren for projecting sound or atmospheric waves of any selected pitch in any desired direction, combined with a pair of widely separated and exceedingly sensitive sound-detecting, receiving, and intensifying appliances so pivotally mounted at the extremities of a yard-arm, and arranged so as to be automatically focused upon the point from which any transmitted or reflected sound originates.

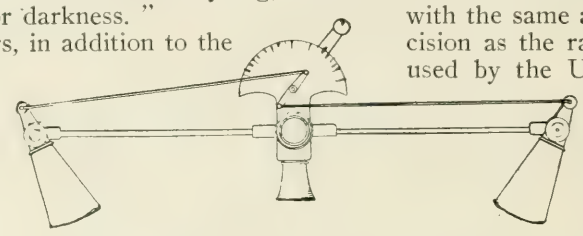
"On large liners and battleships the sound detecting and receiving appliances constitute a 'finding apparatus,' comprising a centrally pivoted yard-arm located on the foremast of the vessel just above the look-out's nest. This arm is mounted upon ball bearings, contains a central pointer moving over a fixed scale, and forms a movable acoustic 'base-line' by which the direction and the exact distance of the source or point of origin of any sound, or series of sound waves, however remote, can be immediately ascertained by automatic triangulation.

"This apparatus is really an acoustic compass, and will penetrate the thickest fogs and make ocean traveling on the darkest nights as safe as by day. It will not only render collision between vessels impossible, however rapid their speed, but also prevent the collision of vessels with icebergs, derelicts, shoals, rocky coasts, partially submerged reefs, bell-buoys, lightships and other obstructions that are invisible in fogs or thick weather, and which now constitute a serious menace to navigation.

"In addition to all this, it furnishes an entirely new, direct, and effective means of wireless communication between vessels, in the form of space telegraphy through the medium of atmospheric or sound waves, in which it supplements and successfully fills the gap left open by the wireless telegraph, by giving direction to all emergency signals and messages exchanged between vessels at sea,

so that the exact relative position and location of all communicating vessels are automatically and continuously indicated, without the necessity of transmitting their longitude and latitude, although the vessels themselves may be beyond visible range or hidden from each other by fog, heavy weather, or darkness."

On ocean liners, in addition to the "finding apparatus" — which is self-sufficient for the smaller steamships and sailing vessels— there is provided a duplicate set of fore and aft instruments capable of being operated from the bridge to face either to port or starboard, which thus afford a "base-line" fully as long as the vessel—800 or more feet in length in vessels of the *Lusitania* class. By means of this apparatus every sound *within a radius of twenty miles or more,* whether emanating from a vessel sounding its fog horn or siren, or whether in the form of reflected sounds or echoes sent back from the surface of an iceberg or other obstruction, even though these may be inaudible to the unaided ear, are immediately and accurately detected and located.



RIES' DEVICE FOR SENDING AND RECEIVING ATMOSPHERIC WAVES.
In the center: the siren for emitting the sound; at either end: the receivers, which catch the echo; at the rear: the scale on which the precise distance and direction of the echoing objects are recorded.

When the movable base line or yard-arm of the "finder" is swung into a position where the sound from both is in unison and of equal strength—as indicated by the visual devices on the bridge as well as by the headphone worn by the lookout during thick weather or fog—the index needle fixed to the center of this movable base line will point directly toward the source of sound, however distant this may be, and the exact distance in miles or fractions may be at once read off from the scale.

The invention is similar in principle to the range finders employed by naval coast defenses for getting the range of hostile warships, with the exception that either sonorous or non-sonorous atmospheric waves are utilized instead of light waves. There are, however, several important differences. The apparatus, it is claimed, will locate the source of a distant sound with the same accuracy and precision as the range finders, now used by the United States and other governments, to find the exact position and distance of an enemy's battleships. But unlike the range finders, this apparatus is practically automatic and self-indicating, requires no computations of any kind, is of a comparatively simple and self-contained construction, and can be operated and focused upon the center or source of sound or other atmospheric disturbance with great rapidity.

In describing his apparatus, Sir Hiram Maxim points out that if a wild bird is captured and liberated in a large room with closed windows, it will make a wild and furious rush for what its senses tell it is an opening through which it can escape, for its eyes do not reveal the presence of glass. The result is a broken neck, but in making the same experiment with a bat, it has been found that before the creature is liberated it does not perceive the glass. To the bat the glass simply appears as an opening through which it can escape, exactly as was the case with the bird, and like the bird, when liberated it makes a rush to escape.

Maxim maintains that with the flapping of the wings its sixth sense is brought into action, and it perceives that it is face to face with a solid wall. It stops short before it touches the glass, but as its eyes tell it that the road is clear, it is naturally greatly puzzled and continues to

DIAGRAM OF OCEAN LINER EQUIPPED WITH RIES' INVENTION.

face the glass, without touching it, for some time. However, it places much more reliance on the sixth sense than on the sense of sight, otherwise its fate would be the same as that of the bird!

Some have suggested that the alleged sixth sense of the bat is nothing more nor less than the sense of feeling. Maxim acknowledges that to a certain extent this may be true.

Others emphatically hold, however, that this organ is peculiar to itself and does not resemble any other known organ of sense. A bird certainly has the sense of feeling highly developed, but it is quite helpless if deprived of its eyes, whereas, experiments show that all bats, with reference to the organ of the sixth sense, do just as well without eyes as with them. This sense certainly seems quite distinct from that of seeing or hearing and is therefore designated as "the sixth sense."

Every naturalist who has ever studied bats seems to admit that the extraordinary appendages attached to the bat's face are organs of perception, more or less allied to the sense of feeling, but not one of them, Sir Hiram Maxim says, has ever suggested that these organs are for the purpose of receiving the echo from the vibrations of the wings, and he claims he was the first to discover this.

He maintains that while the bat seems to be the only animal that sends out atmospheric vibrations, and is guided by their echoes, still, there is in animated nature vast numbers of creatures which send out etheric waves, the most common being the firefly.

Where an abundant supply of high pressure steam is available, as is always the case on a steamship, it is neither a difficult nor an expensive matter to provide an apparatus that will convert as much as 1,000 horse-power of steam energy into atmospheric vibrations, and with the apparatus which Maxim has designed, in which all of the energy is exerted in the direction that the waves are moving, he holds that he is able to produce a much greater effect for the same amount of steam than has ever been produced before.

In experiments which he has already conducted it appears that a very large diaphragm can be made very sensitive to sound waves of a low frequency, and that it is not affected to any considerable extent by sounds of high frequency. As far as ringing an alarm bell is concerned, there seems to be no difficulty in constructing an exceedingly sensitive receiving instrument.

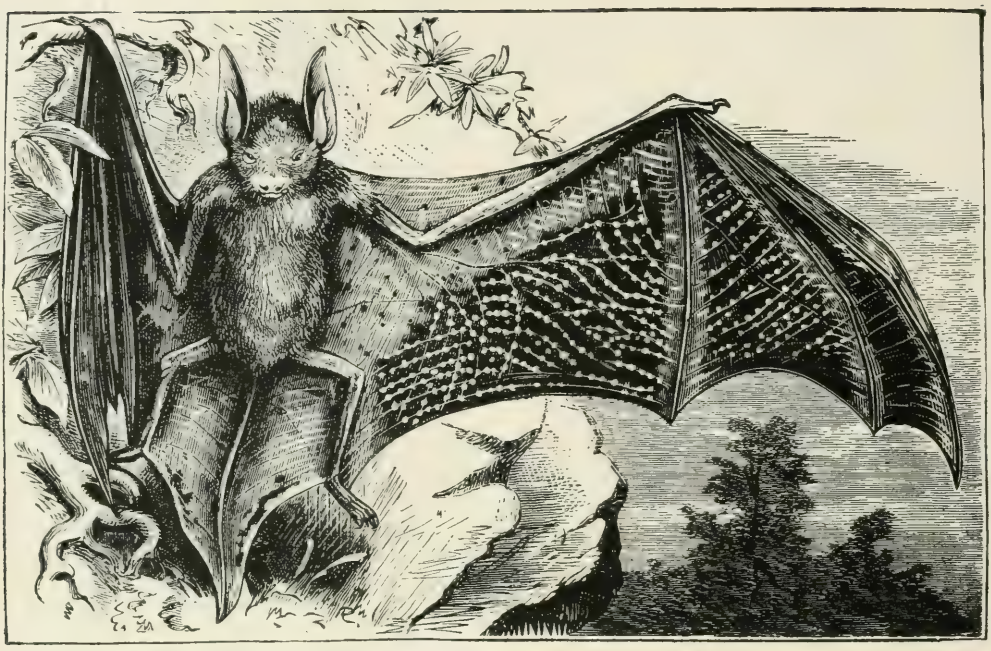
The inventor states, with reference to the sixth sense of the bat, that the energy employed is certainly not more than the one-thousandth part of a horse-power, but it serves the bat's purpose perfectly well. It is necessary to have apparatus which will produce atmospheric vibrations of about the same frequency as those produced by the bat, but instead of using the infinitesimal amount of energy employed by the bat he uses two or three hundred horse-power—that is, he sends out waves that have an amplitude and energy at least three hundred thousand times as great as those sent out by the bat.

These vibrations, although of great energy, will not be audible to the human ears but they will shake up and agitate light objects for a considerable distance, and will travel at least twenty miles, so that they could be received and recorded by a suitable apparatus at that distance, and would be able to travel at least five miles and send back to the ship a reflected echo that would be strong enough to be detected.

It is declared that the quantity of steam required for the purpose would not be very great, because the valve would not be opened very often, and when open would not remain so more than a second at a time. Therefore, the total amount of steam required while signaling was actually going on would certainly not exceed ten horse-power and the apparatus could also be used for communicating with other ships by givingoff long and short blasts representing the dots and dashes of the Morse system.

Having ascertained that the bat does possess a sixth sense, and having discovered the organ that makes this sense possible, he has designed apparatus to accomplish the same thing in a rough sort of a way on a large scale for use on steamships at sea.

The human ear has a range between the note that is given off by a five-eighths inch organ pipe and by one thirty-two



WELWITSCH'S BAT FURNISHES AN EXCELLENT EXAMPLE OF THE SENSITIVE WING THAT ENABLES THE LITTLE CREATURE TO SEND OUT VIBRATIONS AND TO RECEIVE AN ECHO. By analogy, Sir Hiram S. Maxim has constructed an apparatus to prevent collisions at sea.

feet long, but the sound given off by a half-inch organ pipe is not audible, because the sound waves are too frequent. There is nothing in human ears that is able to respond to them, whereas the note given off by a thirty-three foot organ pipe has not a sufficient number of vibrations in a second to bring it within the range of the ear. The American bull-frog, which is about the size of a man's fist, emits a deep bass note which can easily be heard at a distance of two miles —some writers say three miles.

In providing a ship with a sixth sense Mr. Maxim has three distinct devices; one for producing and sending out the necessary waves, one for receiving the reflected waves and making them audible by ringing bells, and a third apparatus for recording the amplitude of the waves. For producing the vibrations of waves a modified form of siren is used, the disc being rotated at a suitable speed by a motor of some kind, preferably an electric motor. A very high pressure of steam is used to produce about fourteen or fifteen vibrations per second. These will not come within the range of the human ear, consequently they cannot be considered as sound, and as they are of great amplitude and power they are able to travel over great distances, and when they come in contact with a body, the waves are reflected back to the ship in the same manner that sound would be reflected back, but this echo would not be audible to the human ear.

The inventor therefore provides an apparatus which might be considered as an artificial ear. It is provided with a large diaphragm tightly drawn over a drum shaped cylinder, and so arranged that the atmospheric pressure is always the same on both sides, quite irrespective of any air blast. It is, therefore, always able to vibrate freely in response to the waves of the echo, and its vibrations are made to open and close certain electrical circuits which ring a series of bells of various sizes. If, for example, the object is very small or at a very great distance from the ship, a very small bell rings, while a large object at a distance of two miles would ring a larger bell, and a very large object a still larger bell. This apparatus gives an audible notice if any-

thing is ahead of the ship and this warns the navigator.

The other apparatus is similar, but instead of ringing a bell it produces a diagram of the disturbances in the air, that is, when there is no noise except that due to the action of the ship or the sea waves, a wavy line is produced, but whenever the vibrations sent out by the vibrator strike an object and return, the wavy line on the paper becomes very much increased in amplitude so as to be easily observed and the distance that the object is from the ship can be measured by the length of the paper strip between the giving off of the vibrations and the receiving of the echo; therefore, the distance can be determined with a considerable degree of nicety and the size of the object may be determined by the amplitude of the waves that return, the direction being altered accordingly.

Bugle Song

The splendor falls on castle walls
  And snowy summits old in story:
The long light shakes across the lakes,
  And the wild cataract leaps in glory.
Blow, bugle, blow, set the wild echoes flying,
Blow, bugle; answer, echoes, dying, dying, dying.

O love, they die in yon rich sky,
  They faint on hill or field or river:
Our echoes roll from soul to soul,
  And grow forever and forever.
Blow bugle, blow, set the wild echoes flying,
And answer echoes, answer, dying, dying, dying.

—*Alfred Tennyson.*

MOTOR ROAD ON TRESTLES

BETWEEN Ventura and Santa Barbara in southern California, a sea level road is being built, which will boast the unique feature of having several long stretches of highway built upon trestles over the beach. The bluffs rise sharply from the ocean in this vicinity, and while the railroad has been able to blast out a way for its tracks, it was found that it would be costly and inexpedient to build a highway for general traffic in this manner. Hence the plan was adopted of swinging the road out over the sands upon causeways, consisting of eucalyptus piles driven deeply into the sand and carrying heavy pine joists and plank flooring. Half a dozen or so of these causeways have just been built to connect the points of land on which regular roads can be built. The longest of these causeways is four thousand four hundred feet in length, and all are of a twenty-four foot width and guarded by stout railing.

"FATHERLESS FROG," "RAISED" BY PROF. JACQUES LOEB. Creation was brought about by a chemical process.

This new road shortens the distance between Ventura and Santa Barbara by nine miles, and makes unnecessary the heavy grades of the present road over Casitas Pass, which is dangerous at certain seasons. In following the strand, the road-builders revert to the original pathway of the earliest settlers, as the smooth beach was used at low tide by the old-fashioned stage coaches and even by the primitive conveyances of the Franciscan fathers in traveling between the missions of Ventura and Santa Barbara.

ONE OF THE CAUSEWAYS ON THE SEA LEVEL ROAD.

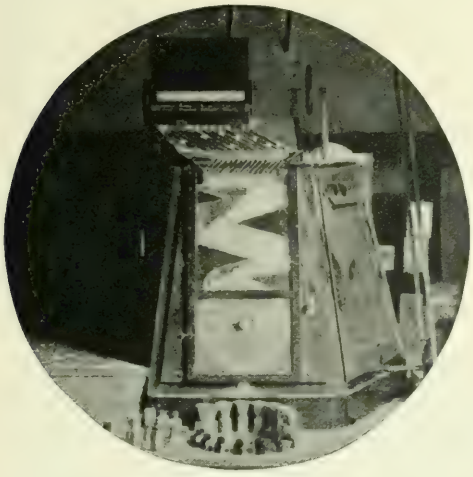
THE FROG THAT HAD NO FATHER

THE "fatherless frog," "raised" by the eminent biologist, Jacques Loeb, was one of the many interesting exhibits at the International Congress of Hygiene and Demography recently held in Washington, D. C. The frog, or rather the frog and a tadpole raised in the same manner, appeared on exhibition in a glass jar and attracted a large amount of attention as presaging the discovery of a new life principle which, if it could be applied to other animals, would have startling results.

According to Professor Loeb's explanation of the frog's "birth," the animal was made to exist by submitting the egg of a female frog to a chemical process. The egg was what is known as a "sterile" one and could not have developed naturally. Under Dr. Loeb's treatment, however, it passed through all the rudimentary stages and became a tadpole, then a fully developed frog, perfectly healthy and possessing all the senses of a "natural" animal of the same class.

The process by which this frog was developed is known among scientists as "parthenogenesis," and is radically different from the process by which a German scientist recently claimed to have

developed life by chemical means without the aid of the male of the species. Professor Loeb, in speaking before the Hygiene and Demography Congress, said that he hoped to carry his secret process still further and predicted startling developments in the new science within a few years



This Machine Counts and Sorts Tablets.

TABLET COUNTER AND SORTER

AN interesting tablet counting and sorting machine has been for some time in continuous operation at the works of a large Berlin chemical factory. This machine is extremely simple in construction. Its mode of operation is as follows:

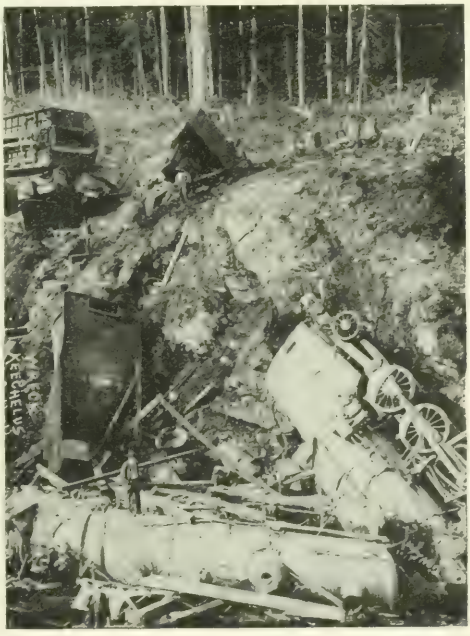
Into a funnel-shaped reservoir is poured any desired quantity of tablets which are mechanically distributed by degrees on a sieve which eliminates any adhering powder. The tablets next appear in the sorter, where all the broken ones are discharged, so that only entire ones penetrate into the counter. A counting wheel by its rotation checks up the quantity of tablets without any chance of mistake, filling bottles or boxes with them, as it does so. Immediately after a bottle or box is filled, the next one places itself automatically below the funnel, in order eventually to make place for a third one, and so on.

This process avoids any contact with the tablets and accordingly guarantees the greatest cleanliness from an hygienic point of view.

The machine is designed either for hand operation or for motor drive, putting 150,000 to 200,000 tablets per day into bottles or boxes. Another type, designed for the filling of tubes, will shortly be brought out.

WHEN THE TRESTLE BROKE

A FAST continental passenger train jumped the track on a wooden trestle forty feet high, one mile from Keechelus, Washington, near the summit of the Cascade Mountains, recently with the result shown in the photograph. Two big mountain locomotives were drawing the train and when the tender of the first one left the rails the flanges of the heavy wheels broke through the wooden ties. Both locomotives, an express car and a day coach fell through the structure as a whole section of the bridge gave way under the smashing blows of the train wheels. The bridge was so completely demolished that not even an upright was left standing at the point where the derailment occurred.



Passenger Train After It Had Dropped Through Trestle a Distance of Forty Feet.

LANDING PLATFORM FOR AEROPLANES ON THE ROOF OF A PHILADELPHIA HOTEL.

Five persons were killed and three hurt. That the death list was, comparatively, so low is attributed to the fact that an all-steel car became wedged across the bridge at the edge of the fallen section and held the tourist and pullman sleepers behind it.

TO WELCOME FLIERS ON ROOF

PHILADELPHIA soon will be the first city in the country to have a hotel equipped appropriately to receive guests who may arrive at the hostelry in aeroplanes. On top of the main portion of the structure, a score or more stories above the street and higher than the top of any other building in the vicinity, there has been erected a commodious landing platform, upon which all forms of aerial craft will be capable of alighting with perfect safety.

The platform is one hundred feet in length and fifty feet in width, with a portable section which can be added to make it eighty feet longer if desired. Around the edges are a series of buffers, composed of ropes weighted here and there with sandbags to catch a plane should an aviator be unable to check its momentum in time to prevent a plunge to the street level.

Another feature which will make the hotel unique, and which will be added in the near future, will be two elevators capable of handling the largest automobiles and connected with a roadway running around a portion of the roof, so that an aviator may step directly into his car.

FROM MACE TO WALLACE, SIX MILES.
How an enterprising Idaho father gets his youngsters to town

CUTTING A CROP WORTH FIFTEEN DOLLARS A TON ON THE MOLZ FARM.

TEN THOUSAND A YEAR FOR HIS ALFALFA

By

HARLAN D. SMITH

ADAM MOLZ is an alfalfa specialist at ten thousand dollars a year. He doesn't wear a high brow or thick spectacles, nor does he travel in a private car. Neither does he make his ten thousand by giving advice or expert testimony. He is a farmer and wears overalls, believes firmly in alfalfa and works hard, grows a big crop every year and sells it for ten thousand dollars. That's all. Sure, anybody can do it—with brains.

Now, as anybody knows, ten thousand dollars is not an unusual income from 320 acres. But for a half section away out in western Kansas—at Deerfield—where it rains only fifteen inches or so a year—about half what is needed—such an income means that somebody is doing some mighty good farming. That's the kind Adam Molz has been doing. In fact he has been doing it so well that the half-section he paid twenty-two hundred dollars for ten years ago, is now worth something like fifty thousand dollars. So, in addition to his big annual income, he has made his farm increase in value at the rate of more than four thousand dollars a year.

IN THE "HAY" YARD.

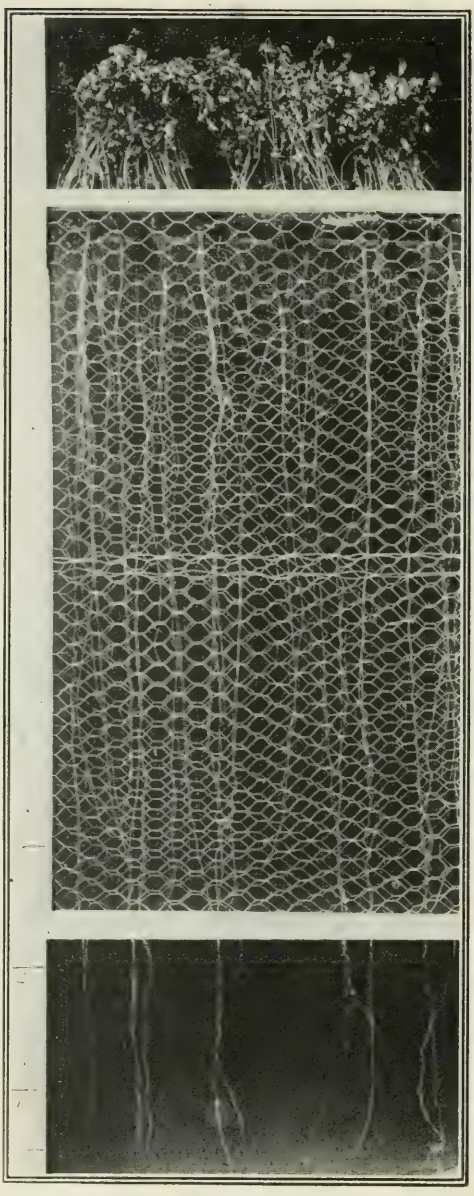
A CEMENT BLOCK BARN ON THE MOLZ FARM.

This is how he started: With barely more than his half-section as capital, Adam Molz, in 1902, began gambling on the weather. He was a wheat grower—when it rained. Some years he would have a pretty good crop. Then would come a pair of dry seasons and gobble up his profits. He saw that wheat as a principal crop could not be de-

pended on. He must have something to fall back upon in bad wheat years. He tried alfalfa and was successful. Every year thereafter he put in more alfalfa. Now he has 240 acres of this crop and will sow still more, leaving only enough ground for an orchard and to grow some feed crops.

A big, comfortable house with running water and modern conveniences in it has replaced the little weathered shack of ten years ago. And, last year, a large cement block barn, fifty-four by one hundred feet, was built to house the fifty head of Percherons. For Molz is not a soil robber. It was necessary to feed some live stock so that the soil's fertility might be returned in the form of manure. On the colts raised every year a nice profit is made.

Co-operating with his fellow farmers, Molz brought an irrigating ditch near his farm and began flooding his alfalfa. Dry seasons don't worry him now. The water, diverted from the Arkansas River about twenty miles away, never fails.



How Alfalfa Goes After Moisture in the Ground. The roots are 8½ feet long.

Ten Years Ago Molz Had Not "Discovered" Alfalfa—This is Where He Lived.

In planting his alfalfa, Molz uses a system which he himself has discovered. Experience has proved its worth. A nurse crop of either oats or barley is sown with the alfalfa seed. If oats, one and one-half bushels to the acre is used, and if barley, one bushel to the acre. Having thoroughly prepared the ground he drills the oats or barley in the spring, then cross drills the alfalfa, using about twenty pounds of good, clean seed for every acre. The oats or barley is harvested in July. The stubble is then cut close, raked off and burned. Molz maintains that the straw stubble should be removed because it has a tendency to "heat" the young alfalfa. The alfalfa later is "topped back" to assist in developing a strong root system. Usually, only one crop is cut every year; the second is left for fall pasture. He gets nine dollars to fifteen dollars a ton for his hay. There also is a profit to be made from the seed. All told, his annual income is eight thousand dollars to ten thousand dollars.

This is bumper

alfalfa year for Kansas, which State, by the way, grows more of this crop than any other—more than a million acres this year. It is probable that Deerfield's ten thousand dollar specialist will break all records. Farmers in the eastern part of the state where irrigation is unnecessary are having unprecedented yields. Chris Olsen, of Barber County, got sixty-eight tons from forty acres at the first cutting. This was worth more than six hundred dollars. And before the season is over he will have cut three more crops.

THIS IS WHERE MOLZ LIVES TODAY.

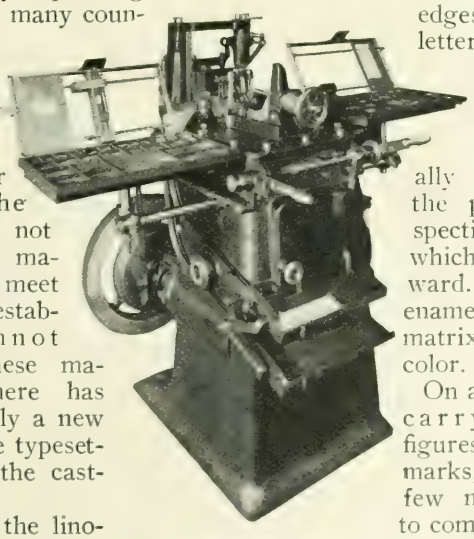
From his 135 acres, James Hoke, of Reno County, harvested twenty-five hundred dollars worth at the first cutting. The first crop of A. Trammell, of Coyville, who has fifty acres was worth $750. On display in Chanute was a plant found by C. E. Eklund. It was four feet high and consisted of 132 straws.

NEW TYPESETTING MACHINE

By

A. C. BERTON

At present there are two kinds of typesetting machines in common use—the linotype and the monotype. Both of them are somewhat costly, and for the proprietors of small job printing establishments and of many country newspapers they are an almost impossible luxury. They are necessarily expensive because of the intricacy of their mechanism, and the price of them will not probably soon be materially reduced. To meet the demand of the establishments that cannot afford either of these machines, however, there has been perfected recently a new and far less expensive typesetting machine called the castaline.

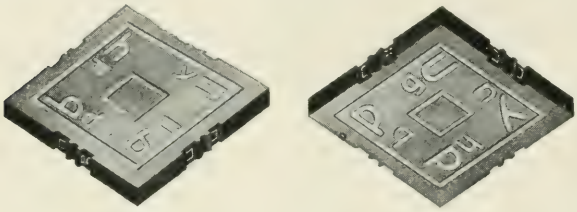


THE NEW MACHINE AS IT APPEARS SET UP AND READY FOR USE.

The castaline, like the linotype, is a slug-casting machine. Unlike the linotype, however, it possesses no keyboard. Instead, the matrices are assembled by hand, and it is in the designing of the matrix that the inventors have shown their greatest originality. The matrices are made of brass, each an inch square; and the edges carry dies for eight letters, two dies sunk into each of the four edges. On the flat surfaces are bold index letters scientifically arranged to indicate the position of their respective dies, no matter which surface may be upward. The index letters are enameled in colors, and each matrix has its distinctive color.

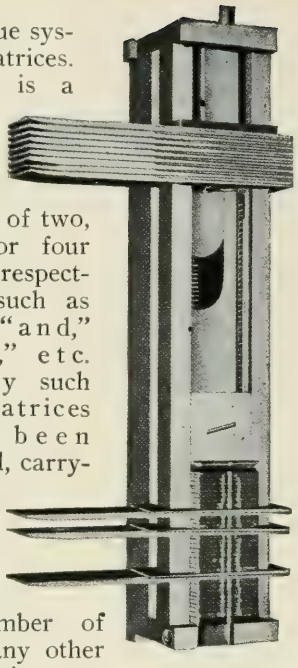
On account of each matrix carrying eight letters, figures or punctuation marks, only a comparatively few matrices are required to comprise a font, and since each kind of matrix possesses a distinctive color for

its index letters it becomes a simple matter to pick up and place the matrices properly in the so-called "stick," or line assembler. The line of matrices is spaced and justified by wedge-shaped steel spacers, after which the assembler is placed in a holder that automatically conveys it to the mould. After the line is cast, the matrices are released and dumped into the compositor's tray. Each machine is equipped with two separate cases for holding matrices and two separate moulds for casting, so that two operators may work on the same machine at the same time, each using a different size or face of type, if desired. Both hands may be used in picking up the matrices, and practice to acquire speed is all that is required for any one to become a good operator.



THE TWO FACES ON THE SAME MATRIX.

Still greater speed in composition than would ordinarily be possible is attained through a unique system of logomatrices. A logomatrix is a matrix containing eight different combinations of two, three or four letters respectively, such as "of," "and," "tion," etc. Thirty such logomatrices have been adopted, carrying 240 prefixes, suffixes and common words. To make use of the same number of combinations, any other kind of typesetting machine would require 240 additional keys.



THE ASSEMBLER OR "STICK," IN WHICH THE MATRICES ARE ARRANGED.

The new outfit will fill a great want, particularly in the smaller offices, where the volume of business does not justify the purchase of a regular linotype machine.

The voice of the people has about it something divine.

—*Lord Bacon.*

QUAINT HOUSE INSCRIPTION

THE adorning of one's mansion with an inscription or motto is certainly very ancient, but few have been so bold as to label their dwelling so conspicuously as that depicted in the photograph. This mansion belongs to an Englishman and is situated at Turvey, on one of the main roads in Bedfordshire. Needless to add the owner is of a religious turn of mind. The inscription is one that is found on many old houses in England. It reads:

"EXCEPT THE LORD BUILD THE HOUSE, THEIR LABOUR IS BUT LOST THAT BUILD IT."

Generally, however, the inscription is installed above the doorway, and not around the entire eaves of the dwelling as in this case, and painted in characters so large that it can be read from the roadway.

A QUEER CATAMARAN.

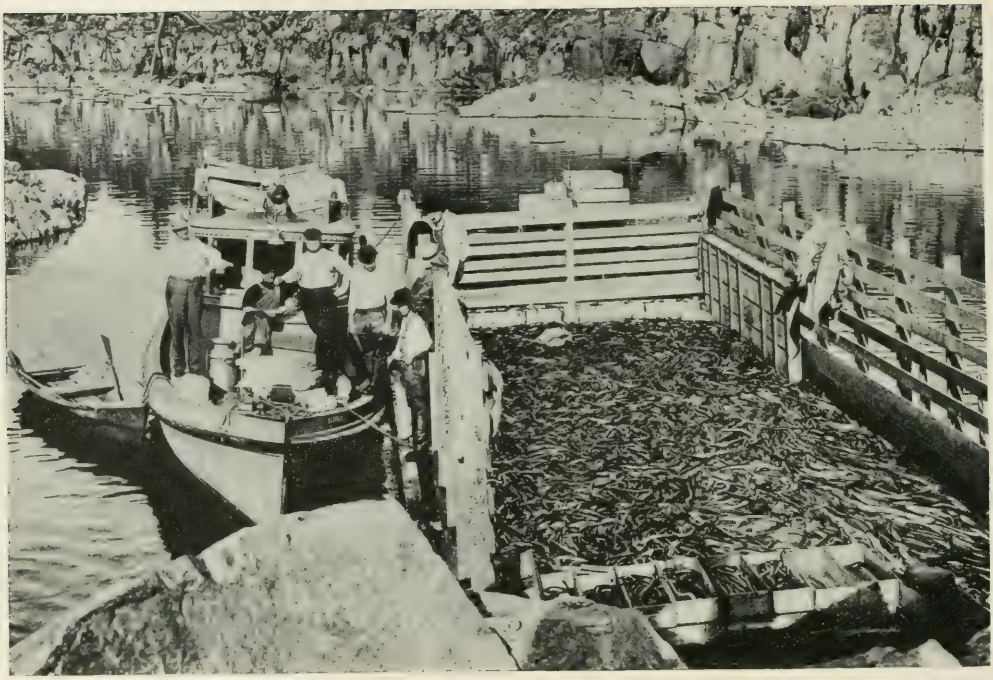
This vessel, which is so narrow that it has to be propped by a float on one side, is a familiar sight to those who pass frequently through the Suez Canal. It navigates the Red Sea.

EELS FOR SALMON FOOD

TENS of thousands of live eels—60 tons of them in all, numbering approximately 276,000 of the wriggly, snake-like fish — were gathered at the falls of the Willamette River, at Oregon City, Oregon, by the Oregon Fish and Game Commission recently in an interesting experiment to determine their value as food for young salmon in the hatcheries. The experiment had a sanitary side as well, for the eels had become so numerous in the summer months as to constitute a serious menace to health. Thousands of them, killed in the effort to climb the falls, would be washed by the current against the banks of the river for miles down the stream, polluting water, shore and air.

In the high water season the eels swarm to the fish ladder built at the falls for salmon and trout to use in ascending to

HOUSE AT TURVEY, ENGLAND, WHICH BOASTS A STRANGE INSCRIPTION.



HALF TON OF LIVE EELS TO BE USED AS FOOD FOR SALMON.

their spawning grounds in the upper river. The eels leap upward and cling to the rocks with their suckerlike mouths at each new height until they can leap again. Some few reach the upper stream but most are washed back.

In capturing the eels on the wholesale plan adopted, most of the water was shut off from the fish ladder, and a barge moored at the lower end, with a chute leading to it from the lower "rung," or pool, of the ladder. The fish wardens then scraped the eels off the rocks at the various levels of the fish ladder, and the water shot them down the chute against a screen across the lower end. When this was covered, they were raked into the scow and then packed in boxes for shipment to the trout and salmon hatcheries.

AUGUSTIN ROSENBERG, INVENTOR OF NEW SYSTEM OF ELECTRO-PLATING.

ELECTRO-PLATING WITH POWDER

CONSIDERABLE interest has been aroused by the remarkable discovery of a young scientist, August Rosenberg by name, in Great Britain, which promises to revolutionize the art of the electro-plater. The electric deposition upon metallic articles by the existing process involves the use of cumbersome and expensive apparatus, and the operation occupies considerable time. The new discovery may be termed as dual in its action. The soiled article instead of being cleaned and polished by some apparently simple and efficient specific which being an abrasive or corrosive only destroys the plating, is rejuvenated entirely by this latest process, for it is cleaned by

the deposition of further silver upon its surface instead of having what is there removed.

The process consists in simply rubbing the article with a powder, consisting of a mixture of a silver and a magnesium salt, a damp rag being used in its application.

This powder comprises really myriads of minute electric batteries. The magnesium acts as the positive pole, while the article under treatment is the negative. When the moisture, as represented by the damp rag, is brought into contact with the powder in combining with the metal salt an electrolyte is produced. Thus the electric battery similarly is produced, and the powder becomes in reality a minute electro-plating plant.

To polish an article by this means all that is necessary is first to wash the object to remove superficial foreign matter, drying it in the usual manner. The plating process as already described is then carried out, and when sufficient plating has been secured, the article is then washed in hot water to arrest the electro-chemical action, being finally polished by a dry cloth or leather. When the article requires cleaning the galvaniting is repeated and then not only is the article cleaned, but the thickness of the film of deposited metal is increased. In fact every time the article is cleaned with the powder it is further plated, so that a paradoxical result is secured, inasmuch as the object is cleaned by further deposit of metal.

HOTEL ON BOARD SHIP

THE Arbuckle Deep Sea Hotel, consisting of two vessels, on the East River, New York, was the pet philanthropy of the late John Arbuckle. When the will of the millionaire sugar and coffee king was read recently it was found that he had made provision for the maintenance of this hotel for working girls, accommodations for whom are provided at the low rate of forty cents a day. This includes room, board, the use of the laundry with soap, blueing and starch furnished. Only young women earning less than ten dollars a week are accepted as guests. The majority earn much less than that.

CAMPING OUT THE YEAR ROUND ON THE UPPER DECK OF ARBUCKLE'S DEEP SEA HOTEL.

A unique feature of the ship hotel is the camp site on the upper deck, which many of the girls prefer to prosaic stateroom accommodations. For them a number of tents are provided, fitted up with two single iron bedsteads, and here the guests who are thus favored may camp out the year round. Dressing rooms on the deck below are provided for the campers.

During his lifetime, Mr. Arbuckle gave a number of wedding breakfasts to young couples whom Cupid had brought together while aboard the hotel.

The Deep Sea is housing over one hundred working girls at a nominal rate. They get, without any taint of charity all the benefits of fresh air, out-of-door life and the salt sea breezes. The food, though simple, is appetizing, well cooked and served.

NINE-MILE BRIDGE FOR SAN FRANCISCO

By

CHARLTON LAWRENCE EDHOLM

FROM the "bedroom of San Francisco," as the cities on the east side of the bay are known, thousands of commuters make their daily journey to work in the California metropolis. The trip requires from twenty to forty minutes, according to the distance of each commuter's bungalow from the ferry boats, and in case of a heavy fog the trip is lengthened considerably and is not unattended by danger. At such times the big boats, crowded to the limit with passengers, proceed across the six miles of water at a snail's pace sounding their fog horns constantly and traveling with the utmost caution to prevent collisions with ferries of the other lines or the shipping anchored in the bay.

There are three such lines from the Oakland and Alameda and Berkeley shores serving communities with an aggregate of about one million souls. Every night the rush is repeated in the opposite direction, while at all times of the day at frequent intervals the ferries pass back and forth with large numbers of shoppers, pleasure seekers and theater-goers. Then there are three great transcontinental lines with their thousands of passengers, all of whom are dependent upon the ferries to reach their goal. In addition to this there are great vessels for transporting cars bodily across the bay, and on these, trains of freight cars, bearing commodities from all parts of this country and Europe, are carried to that narrow peninsula on the western fringe of our continent. Once in the warehouses of San Francisco, this freight or the great bulk of it, merely awaits re-shipment across the bay and to all parts of the Pacific Coast. Besides this there are great shipments from the Orient and from Europe coming by the route around the Horn, all of which have to cross San Francisco Bay.

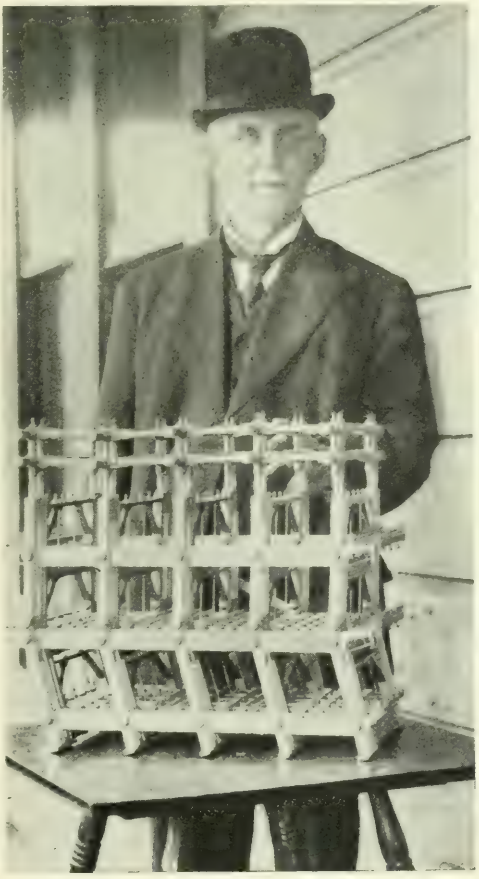
The cost of transporting this vast volume of freight across the bay is estimated at not less than eleven million dollars yearly and with the constantly increasing growth of California's population the expense and difficulties of this method of transportation will increase correspondingly.

After the Panama Canal is opened in 1915, San Francisco's commerce will undoubtedly be augmented at a startling rate. It is in order to provide easy access to the city both for freight and passenger traffic that Allen C. Rush, an engineer of Los Angeles, has developed

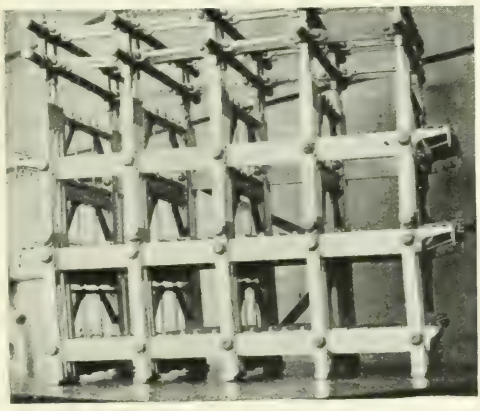
THE FERRY BUILDING, SAN FRANCISCO, WHERE THOUSANDS OF COMMUTERS LAND DAILY.
The proposed bridge will practically abolish the ferry route.

plans for a nine-and-a-half mile bridge to span the waters of the bay.

In order to differentiate his plan from the countless schemes of the past, which have led to nothing, it should be stated at the outset that Mr. Rush has found financial backing for his project, which will require the outlay of twenty-six million dollars, and that the United States Government has recognized his enterprise in a substantial way. The Senate has passed a bill, introduced by Senator Works, granting a right-of-way across Goat Island, which lies between San Francisco and Oakland and is now used as a Naval Training Station. As a matter of course the plans had to meet the approval of the War Department before the Senate would have taken such a step, and it is proposed to grant a tract of several acres of the Presidio Reservation of San Francisco as the western terminal and railroad yard.



ALLEN C. RUSH, WHO PROPOSES A NINE-AND-A-HALF MILE BRIDGE FOR SAN FRANCISCO.



MODEL OF A SECTION OF THE BRIDGE—FRONT VIEW—SHOWING THE CABLES AND THE THREE DECKS OR FLOORS.

The plan as now contemplated is to swing the bridge from Telegraph Hill to Goat Island at a height of 180 feet above the water, allowing clearance for the highest masts that enter the port, and thence to the tide lands near Emeryville. The structure will be supported by ten wire cables each of twenty-inch diameter and each capable of supporting 35,000 tons, which means that a single one of these cables could lift a modern battleship and still have ten tons reserve strength.

Massive granite piers are planned for the rocky promontories of Telegraph Hill and Goat Island, while two piers six hundred feet in height will rest on bedrock in the channel. This would be the most difficult engineering feat, as the current is the swiftest in the channel between the island and the peninsula, while the depth of the water is somewhat less than 150 feet. From Goat Island to the east shore the water is shallower and more placid, leading up to extensive mud flats which are uncovered at low tide. Ten piers in all will be required, each of them having a height of six hundred feet.

For these piers, resting in the waters of the bay, a steel caisson of unique design has been devised by Mr. Rush. It consists of a

hexagonal structure. It will be 150 feet high and taper slightly from the base. It will be built with a series of interior shafts or tubes. They are to extend from the base of the caisson to the top and when filled with compressed air will render the great structure buoyant so that it can be towed to the point in the channel where it is to be sunk, after the manner of a gigantic dry dock. Here the air in the tubes is to be released and the caisson allowed to sink gently into place.

As the great structure sinks into the mud at the bottom of the channel, the tubes will be opened forming a series of shafts into which workmen can descend and excavate to bedrock, the weight of the caisson bearing it down as the mud and rock is removed. When the caisson is at rest upon its foundation these tubes will be filled with granite, making a solid base for the piers. Eight caissons of this type will be sufficient, as spans of unusual length—more than 2,000 feet each—are projected.

In order to accommodate the enormous volume of traffic, three floors or decks will be provided, each of which will have four highways, making twelve in all, exclusive of four footways of lighter construction which project from the side of the bridge. The lower floor will be reserved for the heaviest traffic, carrying rails for freight and passenger trains, while the middle and upper decks will handle the local traffic, street cars, autos and drays, and with the number of highways provided for, it will be easy to segregate this traffic as to kind and direction so that there will be no confusion.

From the top of Telegraph Hill, which is to be the western terminal, it will be necessary to carry the structure a distance of three miles in order to secure a one per cent grade, for the benefit of the heavy freight. This is about the distance to the military reservation where it is proposed to set aside land for a large railroad yard.

Passenger traffic and vehicles that are not dependent upon such easy grades would enter and leave the bridge at Van Ness Avenue, a point convenient to the center of the city, thus greatly shortening the trip.

People throw stones only at trees with fruit on them.

ONE OF THE CAMPS OF THE RECLAMATION SERVICE IN THE WASATCH MOUNTAINS.

UTAH'S GREAT IRRIGATION TUNNEL

By

LEANDER McFALL

PICTURE in your mind if you can a rugged mountain rising ten thousand feet above the sea level, covered with deep masses of snow and swept by the icy blasts of winter, with temperatures ranging from zero to thirty below. Locate this picture in Utah at a point remote from transportation and, except for telephone connection, cut off practically from the rest of the world for five months each year, and you have the site of two large construction camps of the reclamation service near the top of the Wasatch Mountains.

There is no night in these camps. Brilliant arc and incandescent lights, supplied with juice from the government's own electric plant in the valley far below, make bright as day the streets and dwellings of the camp, and cast their reflection across the wastes of snow. During the working period, which runs through the twenty-four hours, three shifts of men alternate on the job. Never ceasing, the diamond drills bite into the sandstone and shale and the dull boom of dynamite echoes in the still air while the mountain top shakes with the heavy blasts of explosives. In the heart of a mountain of sandstone and shale, two large forces of men for five years have been waging a fierce battle with the forces of nature in her unkindest mood.

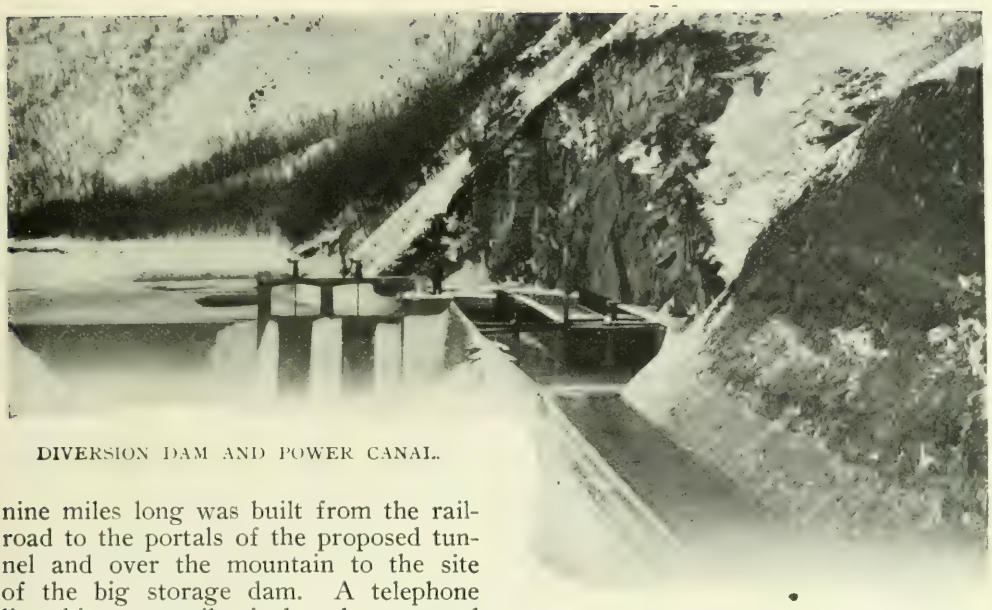
They have pierced the mountain with a huge tunnel which changes a part of the physical geography of the State. Over on the eastern slope of the Wasatch range flows the Strawberry River. Except for the irregular patches of level

WATERWAY CHUTE AND POWER PLANT OF THE STRAWBERRY IRRIGATION PROJECT IN UTAH.

land in the former Uinta Indian Reservation its waters cannot be utilized advantageously for irrigation and its large floods flow uselessly to the Gulf of California. On the western side lies the beautiful Utah Valley, rimmed on all sides by lofty mountains towering above its level floor. Here and there on its broad bosom are the community centers established many years ago by the Mormons and surrounded by irrigated fields and orchards. Every mountain stream has been made to contribute to the irrigation of the land but the water supply is inadequate to cover thousands of acres. To supplement the deficiency, the reclamation service engineers conceived the daring plan of bringing to the valley the wasted waters of the distant Strawberry River.

A Snowslide in the Power Canal.

The engineering problems of the Strawberry project are numerous, complex and spectacular. Preliminary to actual construction, it was necessary to make a thorough reconnoissance of hundreds of square miles of country, much of which was very rough and mountainous and remote from supplies. The watershed of the Strawberry River was carefully studied and the stream flow calculated. Detailed topographic maps were made of tunnel and reservoir sites, canals and roads were located and plans and specifications for the various engineering structures, dams, canals, and a hydro-electric plant were prepared. Then a concrete diversion dam in Spanish Fork River and a cement-lined canal three and one-half miles in length were constructed. From the canal the water was dropped through pipes upon the turbines in the power-house and a large amount of electric power was made available. Simultaneously a broad highway thirty-



DIVERSION DAM AND POWER CANAL.

nine miles long was built from the railroad to the portals of the proposed tunnel and over the mountain to the site of the big storage dam. A telephone line thirty-one miles in length connected these points with the power-house and a transmission line to convey the power to the two tunnel camps was put in operation. Everything was in readiness at portal number one, and as soon as the power plant began to deliver electricity the drills were started.

Boring a tunnel four miles long through a huge mountain is a man's size job anywhere. It was work for a genius here, where remoteness from transportation and supplies, extreme cold weather, deep snows and avalanches in winter, made trying and arduous the task of the man in charge. The actual work of excavating a tunnel is difficult enough in itself, but when complicated with such problems as swelling ground, cave-ins and heavy inflows of water, it takes on the character of a heart-breaking and nerve-racking duty whose only compensation is the game and persistent fight which must be made before victory is achieved. In the Strawberry tunnel an enormous amount of subterranean water was met, the flow for more than a year on the west side having been three-thousand gallons a minute. The men worked knee-deep in water as cold as ice. The cracks and seams in the tunnel's side poured forth a constant flood which occasionally drove them precipitately from their work. When the air struck the shale it disintegrated and great masses caved in. In places the ground swelled and the heavy timbers used for lining crumpled up like paper. It was necessary for the concrete lining to follow closely the miners, and this required a nice handling of the two forces of workmen in narrow quarters in order to avoid delays.

Notwithstanding the numerous and trying obstacles which were constantly encountered, the progress of excavating and lining has been remarkably rapid.

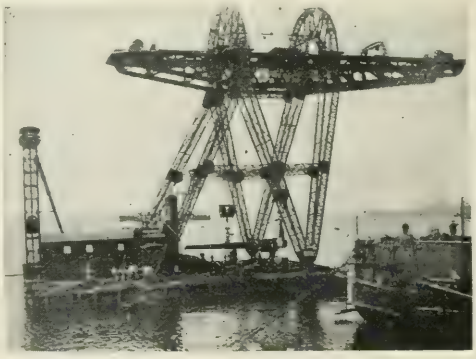
At the east portal is the reservoir site covering eight thousand acres of almost perfectly flat land. By means of an earth fill dam with concrete core wall, seventy-one feet high, and four hundred and eighty feet long, the entire flow of the Strawberry River is diverted into this reservoir which has a capacity of two hundred and seventy-eight thousand acre-feet. In less than a year's time the waters of a stream now flowing into the Gulf of California will be turned into a valley which has no drainage to the ocean and an alteration in the physical geography of the State of Utah will have been successfully accomplished. More than sixty-thousand acres of the Utah Valley will be assured a never-failing supply of water and the future prosperity and permanent development of more than a thousand farms will be guaranteed.

STATE-ADOPTED CHILD PROVES SUCCESS

WHEN the State of Pennsylvania, through a special act of its legislature, officially adopted little Kathryne May Frick, of Harrisburg, three years ago, the child was a nervous, shrinking girl, whose motions were uncontrolled and who seemed hopelessly lost among her surroundings. She was cut off from every form of communication but she showed by her nervous activity and her pathetic attempts to get in touch with those around her, the stirring of an unusual mind.

KATHRYNE FRICK—AT LEFT—A DEAF, DUMB AND BLIND PRODIGY.

To the legislators she appeared a child to be exceptionally fated and unfortunate, and her hopeless plight appealed to them to such an extent that they appropriated $5,000 for her education. Little Kathryne May has been deaf, dumb and blind since she was five years old. She was placed in the Pennsylvania Institute for the deaf and dumb at Mt. Airy, Philadelphia, and so remarkable has been her progress that educators everywhere who have wondered at the marvelous skill attained by the child, predict she will become a second Helen Keller.



120-TON FLOATING CRANE AT THE POLA DOCKYARD, AUSTRIA.

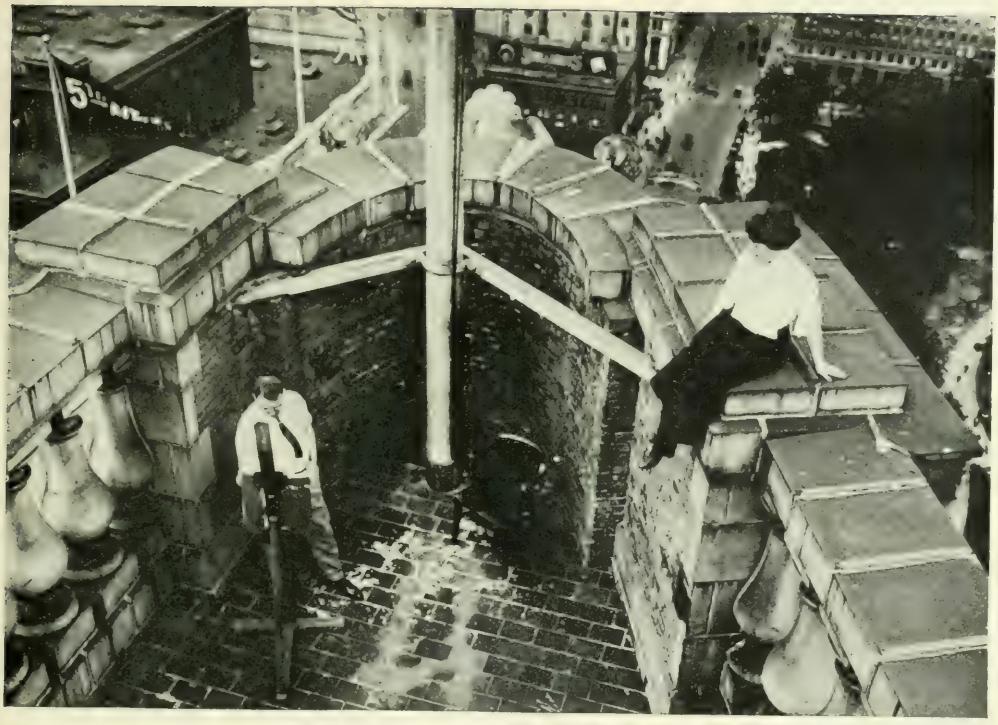
Kathryne's teaching has been oral and manual. The process began by bringing the child in contact with objects and spelling their names into her hand by the teacher, who had instructed her in the manual alphabet. The next step was to train her to give back the word. In order to express the idea of a face she had to learn how to spell the word into a listener's hand, then she had to be taught to print it in Braille as well as to read the characters and lastly, to form the letters on a typewriter.

The typewriter is now a favorite means of communicating her thoughts. She will settle herself at the machine and write page after page of observation, all well expressed and perfectly punctuated.

NEW GUARD KEEPS LIVE STOCK OFF RAILS.
It consists of spiked boards, set between the ties, which are bevelled and also spiked. The boards are hung from rods.

POWERFUL FLOATING CRANE

A FLOATING crane of exceptional size, now in use at the Austrian Naval Dockyard, Pola, on the Adriatic, is herewith shown. The crane is designed to deal with the heaviest weights in ship construction and also, in an emergency, to raise sunken submarines. The crane is provided with two crabs, each having a lifting capacity of one hundred and twenty tons



ARTIST PAINTING A MODEL WHO IS POSED ON THE PARAPET OF A BUILDING AT FIFTH AVE. AND BROADWAY, NEW YORK CITY.
This is part of the "studio" of a colony of artists.

AN INTREPID HUNTER AND HER TROPHY OF THE CHASE.
Mrs. R. J. Elledge, of Monolitte, Cal., who, unassisted, in the wild mountainous region north of the Tehachapi Valley, a country abounding in wild game of every description, shot the mammoth grizzly shown. The bear weighed 575 pounds.

A BUNCH OF GUINEA PIGS THAT WERE RAISED FOR THE MEDICAL MARKET.

RAISING VICTIMS FOR SCIENTIFIC EXPERIMENT

By

FORREST CRISSEY

A CERTAIN New England woman having a small place on the outskirts of a Massachusetts village found herself in the position of requiring a little addition to her modest income. Whatever she did to increase this must be done on the farm, and as an incident to her regular occupation of running the place. For some time this seemed a difficult problem to solve, but among those of whom she took counsel was a friend or relative connected with a large medical college in Boston. Laughingly he made the suggestion:

"Why not raise rats and mice and guinea pigs and pigeons and other things that are sacrificed on the altar of science at the college? Your farm may not be able to produce bumper crops of corn, wheat and such crops, but it seems to me that it would be a first class place for rats and mice and rabbits. Seriously, we do use a great many of these things in the investigating department of the college and I understand that the supply is rather unreliable. Very likely if the management could find a dependable source of supply for these things a good price could be had for them. An institution of this sort would be willing, I am sure, to pay a premium for being able to get exactly what is wanted at the moment it is required and without any bother or trouble. But, perhaps, being a woman, you would not care to go into the rat and mice business?"

WHITE RATS THAT WILL SERVE THE ENDS OF SCIENCE.

"Oh," replied the plucky New England

woman, "I wouldn't mind that in the least, provided it could be made to pay—only I would insist on having the rats white and the mice blue or some other than 'mouse color.' Will you look into it and find out about the matter?"

He did, and his report was that she could have the business of the institution and at set prices in which she saw a very handsome profit. The stocking and starting of her strange enterprise was attended with some difficulties, and no end of amusing experiences; but she soon had it under good headway. Perhaps one explanation of her success was that, being a New England woman, she was intolerant of uncleanliness in any form or place, with the result that all of the rats, mice, guinea pigs and rabbits that she raised were produced under the most sanitary conditions.

One of the Guinea Pigs.

This was undoubtedly an important element in her success, as a prime requisite in an animal for innoculation in an experimental laboratory is that it shall be thoroughly vigorous and healthy before being subjected to an experiment. At any rate, the rocky little hill farm entered into a new period of prosperity under the reign of its strange experiment of freak farming, and while its proprietress has not taken the public into her confidence with regard to the amount of her profits, it is certain that her unique business has been built up to a point where it yields her more than a competency. According to one informant her gross income from this source is probably not less than three thousand dollars a year, and a very large percentage of that income—perhaps two-thirds—is net profit.

COUNTING AND EXAMINING NEW MONEY.

CURRENCY TO BE MADE SMALLER

By

ROBERT H. MOULTON

THE Treasury Department of the United States has decided that there is too much paper money in the country, and so it is going to reduce the quantity—but not the supply. This is not a paradox. It simply means that in the future the United States currency will be made smaller.

A dollar bill today is more than three inches wide and a little over seven and one-quarter inches long. It is to be cut down to six by two and one-half inches. The same will apply to notes and certificates of all other denominations. The order for this change has already been issued by Secretary MacVeagh and the new bills are now being made. It will require eighteen months, however, to make the change complete.

The reasons for this change were several. In the first place it is estimated that it will save the government something like $600,000 in issuing the paper bills. The saving on paper alone—for 240,000,000 notes issued per annum—will amount to at least $85,000. Then there will be an increased output of at least twenty-five per cent for a given amount of labor at the Bureau of Engraving, where all the paper money is printed. This gain, carried through all the processes of printing, examining, counting, drying, and numbering, will, in itself, represent more than $200,000 a year.

The notes being smaller, less engraving will be required for the plates from which they are printed. Also, less ink will be used—an item much more important than might be imagined. In addition to this, it is estimated by the treasury experts that the new bills will have a "life" at least one-third longer than the old ones, because they will require one less fold in order to be stowed away conveniently in pocket book. This means that there will be fewer bills to be redeemed unfit for future use, and the force for the redemption division at Washington can be cut down sufficiently to save $50,000 a year in salaries. At

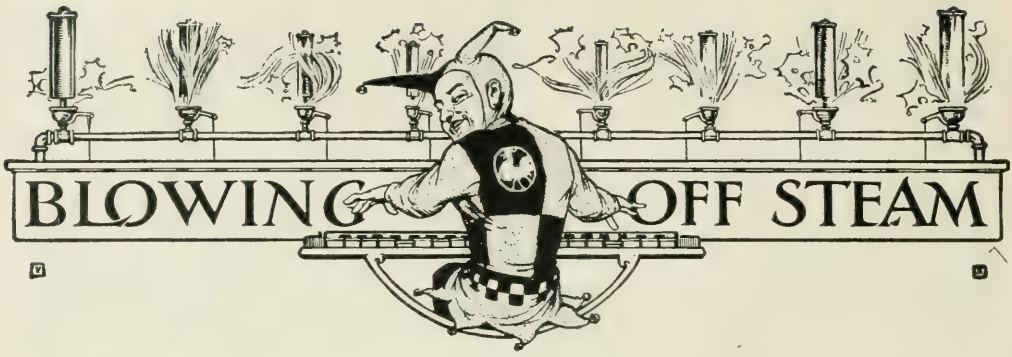
present it costs the government one cent to print and issue a dollar bill.

The new paper money will not only be more convenient for the public, but easier for bank clerks and tellers to handle. Experiments made in Washington banks recently showed that the small notes do not cramp up the fingers as do the old ones. These experiments were conducted with the paper currency of the Philippines, which has replaced the old Spanish notes, and is of exactly the size now proposed for our own greenbacks and certificates.

Incidentally it is planned to reduce the nineteen designs on the currency now in use to nine, using the same portrait on one denomination throughout. Thus the one-dollar bill, whether treasury note, bank note or certificate, will bear the head of Washington in the center of its face. Its holder will know the denomination without looking at the numbers on it.

PLATE VAULT AT THE BUREAU OF ENGRAVING.
Here are kept all plates, dies and rolls used in the printing of money and national securities. The plates are issued each morning, and receipts are given by the workmen using them. At the close of each day the plates are returned to the custodians.

Nuts are given us, but we must crack them ourselves.



Healthy Apartments in the Country

"Dear me! What an unpleasant odor! Can it be the drains?"

"Can't be the drains, miss, 'cos there ain't any."

A Blow from the Bishop

Of the late Bishop Charles G. Grafton a Fond du Lac man said: "Bishop Grafton was remarkable for the neatness and point of his pulpit utterances. Once, during a disastrous strike, a capitalist of Fond du Lac arose in a church meeting and asked leave to speak. The bishop gave him the floor, and the man delivered himself of a long panegyric upon captains of industry, upon the good they do by giving men work, by booming the country, by reducing the cost of production, and so forth. When the capitalist had finished his self-praise and, flushed and satisfied, had sat down again, Bishop Grafton rose and said with quiet significance: 'Is there any other sinner would like to say a word?'"

Painted Beauties

The banquet hall was adorned with many beautiful paintings, and the president of the little college was called upon to respond to a toast. Wishing to pay a compliment to the ladies present he designated the paintings with an eloquent gesture and said:

"What need is there of these painted beauties when we have so many with us at the table?"—*Ladies' Home Journal.*

Putting It Up to Papa

"Father, is it true that two can live as cheaply as one?" "That's an old saying, my dear." "Do you believe it?" "I think it can be done." "But if I marry George do you think you can manage to support him with the sum you now spend on me every year?"

—*Detroit Free Press.*

Sister's Weight

Senator Borah was talking at a dinner in Boise about an embarrassing question that had been asked at Chicago. "The question," he said, smiling, "went unanswered. It was like little Willie's query. A young gentleman was spending the week-end at little Willie's cottage at Atlantic City, and on Sunday evening after dinner, there being a scarcity of chairs on the crowded piazza, the young gentleman took Willie on his lap. Then during a pause in the conversation little Willie looked up at the young gentleman and piped: 'Am I as heavy as sister Mabel?'"

Dizzy and the Duke

The Disraelis were visiting Strathfieldsaye in the time of the old Duke of Wellington. Going up to the bedroom, Disraeli found his wife and her maid moving the bed from one side of the room to the other. When he inquired the reason, his wife said: "Well, my dear, the duke sleeps on the other side of the wall, and if I lie against it I can boast that I have slept between the two greatest men in England."

They All Agreed

BELLE—"How silly men are when they propose! Why, my husband acted like a perfect fool."

NELL—"That's just what everybody thought."—*London Opinion.*

Little Brother

SHE—"My little brother will not bother us tonight."

HE—"That's good. When does the funeral take place?"—*Chicago Daily News.*

He Was Too Busy

AN Episcopal clergyman, rector of a fashionable church in one of Boston's most exclusive suburbs, could not be bothered with the innumerable telephone calls that fall to one in his profession, so he had his name left out of the telephone book. A prominent merchant of the same name, living in the same suburb, was continually annoyed by requests to officiate at funerals and baptisms. He went to the rector, told his troubles in a kindly way, and asked the

parson to have his name put in the directory. But without success.

The merchant then determined to complain to the telephone company. As he was writing the letter, one Saturday evening, the telephone rang and the timid voice of a young man asked it the Rev. Mr. Blank would marry him at once. A happy thought came to the merchant; "No, I'm too damn busy writing my sermon," he replied.—*Everybodys.*

The Motor Craze

TEACHER—"If a man saves $2 a week, how long will it take him to save a thousand?"

BOY—"He never would, ma'am. After he got $900 he'd buy a car."—*The Wilson Worker.*

Looking Ahead

HUSBAND—"And once for all, don't talk to me about your first husband."

WIFE—"All right, dear; we'll discuss what sort of a man your successor is likely to be."
—*Fliegende Blätter.*

A Natural Mistake

A RICH Chicago broker was strolling on State street one day when his beautiful young wife stole up behind him, threw her arms around his neck, and kissed him heartily. "Tut! tut!" the man said, hurriedly straightening his hat. "Tut! tut! This sort of thing, my dear, is most undignified." His wife dropped her eyes and answered demurely: "Oh, excuse me, John—I didn't know it was you."

Nightmares

"I DREAM my stories," said Hicks, the author. "How you must dread going to bed!" exclaimed Cynicus.—*Tit-Bits.*

By Way of Contrast

A TOURIST from the East, visiting an old prospector in his lonely cabin in the hills, commented: "And yet you seem so cheerful and happy." "Yes," replied the one of the pick and shovel. "I spent a week in Boston once, and no matter what happens to me, I've been cheerful ever since."

When the Cannon Boom

"BANG!" went the rifles at the maneuvers. "Oo-oo," screamed the pretty girl—a nice, decorous, surprized little scream. She stept backward into the surprized arms of a young man.

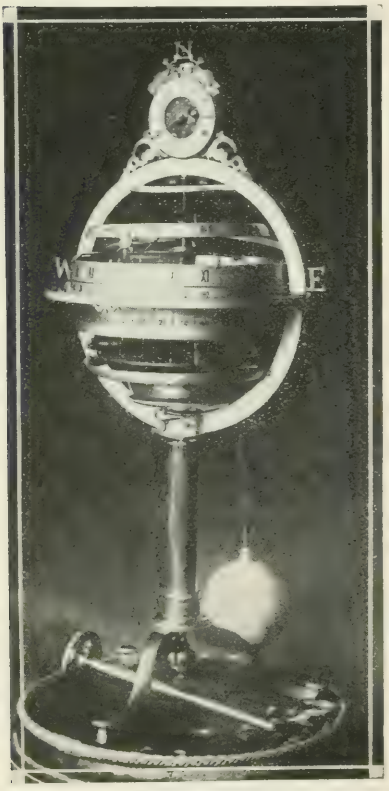
"Oh," said she, blushing. "I was frightened by the rifles. I beg your pardon."

"Not at all," said the young man. "Let's go over and watch the artillery."—*Cincinnati Times-Star.*

HOUSES WITHOUT NAILS

SOME of the Ruthenian immigrants who are settling in northern Alberta are introducing somewhat novel architectural methods. Their first attempts at house building are usually of the kind they had been accustomed to over in Europe, and their buildings are of the typical Ruthenian style—log, pitch-roofed, thatched, and wide in the eaves. In many cases these buildings are put up without a dollar's worth of hardware. Even the door, an affair of slender twigs woven and laced together, swings on home-made hinges and is latched with a wooden hasp. The floor is of hewn logs, unnailed. The roof, as the favorite Russian roof always is, is a wonderful fabric of poles and cross-poles, through and over which has been woven wheat straw, ten inches thick, packed tight and solid, and laid with such care that it will shed the weather for twenty years. It seems almost a pity to give such ingenious carpenters our modern American tools, but it is worth noting that after a year or two they graduate from these primitive buildings to more pretentious ones made after the style that the rest of us favor.

RUSSIAN HOUSE IN CANADA.



THIS REMARKABLE CLOCK SHOWS TIME ALL OVER WORLD.

SHOWS TIME ALL OVER WORLD

THIS unique clock shows the time all over the world by a very clever mechanical arrangement of rotating bands, showing respectively the hours and minutes, the different countries being marked on a fixed ring representing the equator. London time is shown as the meridian by a fixed star.

To tell the time in India, Australia, British Columbia, New York, Mexico, St. Petersburg, Persia, China, Siam, etc., etc., it is only necessary to find the particular country on the fixed Equatorial ring; the time can then be seen at a glance on the rotating hour and minute bands placed immediately above—there is also another band showing the degrees.

Placed on the top of the clock is a calendar which shows the day of the week, day of the month, month of the year and the moon's age by means of a rotating ball. There is also a dial showing London time. The calendar and dial are automatically worked by the clock movement and the calendar is perpetual.

The movement is of very fine workmanship and is the result of many years' work. The frames are of brass and are of the type known as skeleton, so that the working of the clock may be observed; the escapement is of a very curious and unique pattern. The wheels, pinions, and rack-repeating striking work are beautifully made and of the very highest finish.

LIMOUSINE AEROCAB FOR PASSENGER SERVICE.

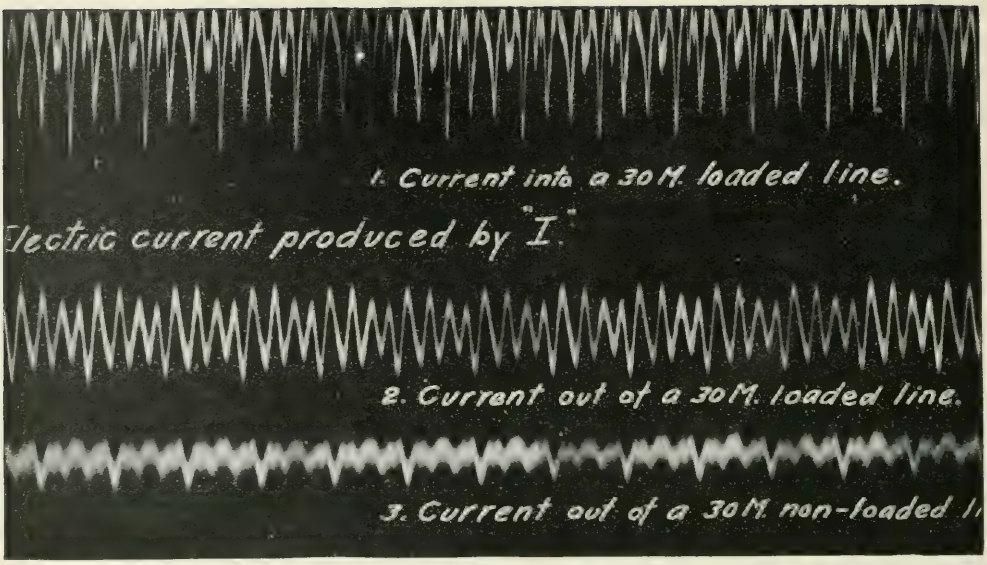
A LIMOUSINE AEROCAB

THE newest development in aviation is the limousine aerocab. This is a remarkable step forward and may lead in time to the regular travel by means of aeroplanes. This new type has been built by an Austrian manufacturing concern and has been proved in actual trial flights very effective and reliable. As the pictures show, the machine is a monoplane which can carry in its body, which is entirely closed, two passengers and the pilot. The seats are very comfortable and the view entirely unobstructed. The entrance is by means of a side door, similar to that of an automobile limousine. The body has the shape of a bird, and when high in the air it resembles very closely a huge bird. An innovation in connection with this aeroplane is a device for changing its speed so that it is possible to ascend at a greater speed and to land more easily than is generally the case; furthermore its adaptability to the changing currents of the air is greatly increased. The motor develops sixty horsepower; the propeller makes 1,300 revolutions per minute. The maximum speed of this aeroplane is seventy-five miles an hour.

LATEST IN CRIMINAL DETECTION

ELECTRICAL authorities in the University of Michigan have discovered what they believe to be the surest method of criminal detection yet known. It is in the photographing of the human voice by means of the oscillograph.

The oscillograph is a combination light plant, telephone and photograph gallery all encased in a little box two feet long, 18 inches high and ten inches wide. A small but very powerful electric arc light throws a beam of light about the size of a lead pencil against a minute prism of glass. This refracts the beam to the back end of the box where it strikes a small cell filled with


1. Current into a 30 M. loaded line.
lectric current produced by "I."
2. Current out of a 30 M. loaded line.
3. Current out of a 30 M. non-loaded l

PHOTOGRAPH OF THE SPOKEN LETTER J TAKEN BY THE OSCILLOGRAPH.

oil. Suspended in this cell by means of silver wires is a little mirror almost too small to see with the human eye, but it is this mirror that turns the sound vibrations into light vibrations that are recorded on the photographic film. The mirror reflects such portions of the beam of light, that falls upon it, back through a slit less than a half inch wide in the opposite end of the box through which the minute ray of light falls upon a rapidly revolving photographic film. The mirror is connected by means of the silver wires with a common telephone transmitter into which the words to be photographed are spoken. The vibrations in the transmitter cause similar vibrations of the little mirror through the beam of light in the cells and this fitful vibrating of the reflector is faithfully recorded on the revolving film.

LOWERING A CAPTIVE OCTOPUS TO PICK UP ARTICLES DROPPED OVERBOARD.

This ingenious method of fishing is adopted by the natives in Suda Bay, off the coast of Greece. Many valuables are thus recovered as this region is the favorite resort of the British fleet in the Mediterranean.

The use of this apparatus in the detection of criminals is based upon the physiological fact that every set of vocal cords differ from every other set of vocal cords, or in other words, every human voice is different in some quality from every other human voice. The difference in the vocal cords causes a difference in the nature of the vibrations in speaking any given word and the different sound vibrations produces exactly different light vibrations Therefore, no two human voices can produce the same picture of any spoken letter or word.

By photographing the voices of convicted criminals and keeping these records in a permanent file, present methods of identifying suspects by means of finger prints and certain measurements, may be backed up by reference to the voice records. If they agree with the conclusion otherwise reached the identification will be more absolutely certain and beyond question.

TECHNICAL WORLD MAGAZINE

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Out HUMANITY'S

WHERE MILLIONS OF DOLLARS WORTH OF LAND WAS SOLD FOR A SONG.

The City of San Diego owned 48,000 acres. Though this big tract is now worth $75,000,000, most of it went for less than one dollar an acre. The city is holding fast its remaining 7,000 acres.

# of CESSPOOL

By Walter V. Woehlke

THE thing happened in three short months.

In September John Deering was decently dressed, decently housed, well fed, had a little money in the bank, just like you and I.

In December he was walking the streets, homeless, penniless, unkempt, ragged, begging for a meal whenever pride took the count before the onslaught of hunger.

In September, the policeman was to him a part of the scenery, like the lamp post; in December he slunk across the street, rounded the corner at the sight of an officer.

John Deering had committed no crime. He neither drank nor gambled. His one sin was negative, passive. He had lost his job.

The penal code prescribes no punishment for losing one's job. Society does, though. The punishment is the Slide. At its bottom is the cesspool of humanity, the blue, ghostly flicker of an alcohol lamp deepening its shadows.

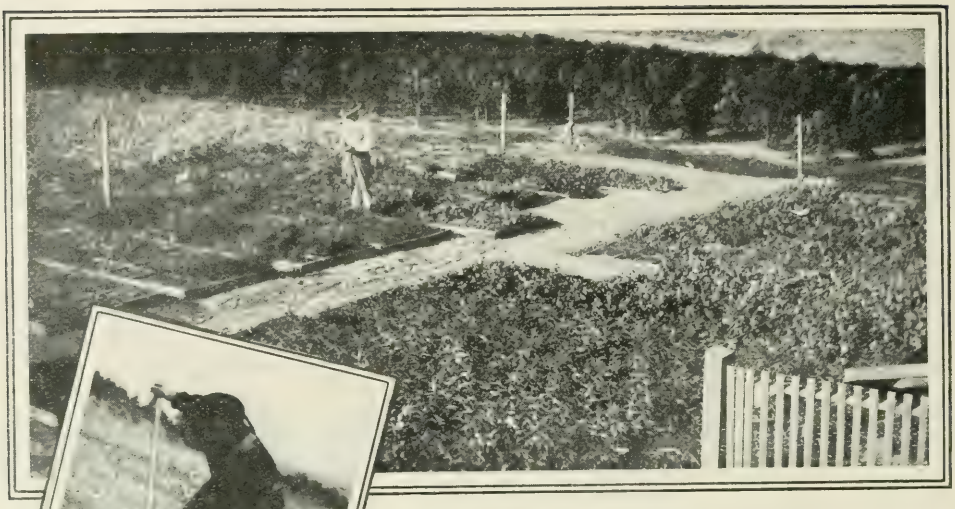
The Slide is an incline with a very hard, very smooth surface. The first stop is at the bottom.

Want to see the penalty inflicted?

Early in September the dam was finished, the construction camp broke up. John Deering, stock clerk, was paid off. He did not worry. He had been paid off before, but always he had managed to find something else without delay. He did not realize that society was forcing him upon the toboggan, pushing him down, the minute his pay was stopped. The future never scared him. He was young and no weakling. His great-grandfather had signed the Declaration of Independence. There was courage, good blood, pride of race in John Deering.

A costly search of three cities revealed an abundance of idle timekeepers and stock clerks. Deering heard that San Diego was booming, building large storage works, an exposition, spending a million in harbor improvements. He found San Diego overrun with mechanics, clerks, laborers. Deering, hopeful, staid. His money went. He pawned his watch. No work. He pawned his suit case. No work. He pawned his best clothes. No work. His last dollar went. With it went Deering, out on the street, down the Slide. He slept in an abandoned shack. A nail tore his coat. His beard grew; his linen became foul. Deering's exterior resembled the make-up of a typical bum.

Within, a similar transformation was going on. Chronic hunger was slowly strangling self-respect, ambition, hope. Deering, bewildered by the speed of the descent, was fast losing his grip. Whiskey was prying at his fingers, promising a dream kingdom if he would let go. Below, the uneasy surface of the human cesspool—its stench fills a thousand police courts every morning—was waiting. The steady pressure from above never relaxed. In the winter of 1911 society everywhere was crowding the chute with victims who had lost their jobs. Everywhere the mass of derelicts left to rot on the beach by the receding industrial tide was piling up. In San Diego the number of hungry men was so large that a feeling of dread stole into the comfortable homes. Society was afraid of those whom it had thrown on the dump. But society did nothing. Deering would



STARTING SAN DIEGO'S MUNICIPAL FOREST.

have plunged into the cesspool, five hundred others would have followed him if Max Watson, the young pueblo forester, had not spread the life net at the bottom of the chute.

Deering, saved from the Slide, is now drawing eighty dollars a month in his old avocation. Hundreds of other mechanics and clerks, safely labeled with society's badge of respectability, the weekly pay envelope, are gratefully remembering the pueblo forester's life net.

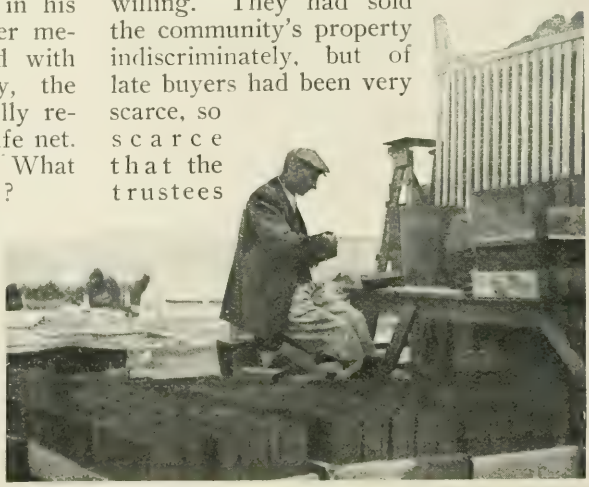
What is a pueblo forester? What had he to do with the unemployed?

The answer concerns itself with Spain, with the Missions of California, with land speculation and with the inertia, the stupidity of the collective citizen in the handling of community property.

In 1769 when the Franciscan padres founded the pueblo of San Diego, alongside of the first link in the chain of the California Missions, the Spanish crown endowed the new settlement with seventy-five square miles, 48,000 acres, of land. Every square foot within the communal limits was common property. Did ever a town begin its career with an asset more valuable?

Let us skip a hundred years. In 1869 the West was gridironed with paper railroads. One of them was to have its terminus at San Diego, the collection of somnolent adobe huts at the edge of the mud flats that reached far into the silver bay. In advance of the railroad boom came Alonzo Horton, a shrewd Yankee trader.

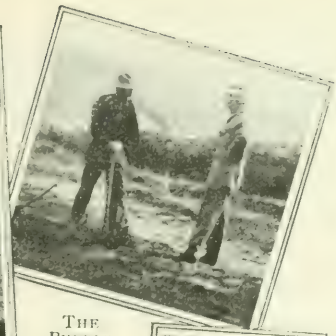
Horton wanted to buy a slice of the pueblo lands. The town trustees were willing. They had sold the community's property indiscriminately, but of late buyers had been very scarce, so scarce that the trustees



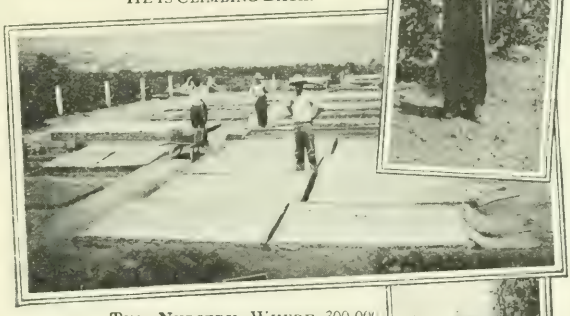
THE "BISHOP" FILLED THE PULPIT FOR FIFTEEN YEARS BEFORE HE SHOT DOWN THE TOBOGGAN. THE MUNICIPAL FARM IS LIFTING HIM OUT OF THE MIRE.

Beans and Grains Growing on the Unirrigated Land of San Diego's 7,000-Acre Municipal Farm.

Society Shot This Man Down the Slide, but He Is Climbing Back.



The Pueblo Forester and One of the Rescued Workers.



The Nursery Where 300,000 Trees Are Grown Annually by Reclaimed Men.

A Year's Growth of Tree—A Two-Weeks' Growth of Man.

remained in office long after the expiration of their terms. There was no money in the treasury to defray the expense of electing their successors. Horton removed the difficulty by advancing a five-dollar gold piece. Immediately the election machinery began to whirr, new trustees were chosen and two thousand acres auctioned off, Horton's bid of twenty-six *cents* an acre being the sole and the highest offer. Two years later Horton, having built a wharf and a hotel, actually felt his right arm grow numb from handling the cash of the lot buyers on steamer days.

Booms came, booms went. The town grew in size, but not in wisdom. It continued to sell its birthright for a mess of pottage, continued to divert the unearned increment from the public pocket, where it belonged, into private hands. Individually the citizens' sharp eyes spotted an opportunity for profit at the distant horizon; collectively they pensively chewed their cud while land speculators abstracted the cream of the communal lands. No other city ever wasted its birthright more prodigally, more stupidly than did San Diego. Here is a flagrant instance:

Some ten or twelve years ago a tract of pueblo land on the shore of a shallow inlet to the north of the city proper passed into the hands of a speculator for a pittance. He cut the land up into small lots, sold them at five dollars apiece and retired with a large profit. A mere woman, a temperance lecturer, invested her savings in seven hundred of these five-dollar lots. A short time ago she sold two hundred of them for $20,000. Nothing had been done to improve the land except the driving of stakes. Every dollar of the enhanced value was created by the community, but the community had foolishly parted with the land that carried the increment. On this little tract of three hundred acres the town cheated itself out of a quarter million, an increment which the citizens themselves added to the land that was their own. At this rate the city, had it retained but half of its original endowment, would not need to levy one cent in taxes today; it could build its exposition, buy its water works, acquire its car lines, its gas and electric plants without incurring a cent of indebtedness.

Do you remember the awakening of the civic spirit, the general municipal

SAN DIEGO SOLD THIS LAND FOR THIRTY DOLLARS AN ACRE—THE PURCHASER

housecleaning and stocktaking that followed in the lee of the muckrake ten years ago? To San Diego that awakening was worth a million cold, hard dollars.

In 1908 San Diego climbed into the bandwagon, changed to the commission form of government and adopted a brand-new, up-to-date charter. Someone quietly slipped into this charter a provision reserving all the remaining pueblo lands from sale until 1930 and appropriating the proceeds of a two-cent annual tax levy for their improvement. The provision was adopted and promptly forgotten until $13,000 had accumulated in the improvement fund in 1910. At last the remnant of the pueblo land was surveyed. Out of 48,000 acres only seven thousand acres were left. That remnant is worth a million today. By 1930 that area will be worth a good deal more than a million.

The eleven remaining sections lay on a broad tableland ten miles north of the city proper, on a wide ridge overlooking the blue sea and the purple peaks ranged in a vast half-circle east, south and north. Except for a small grove of Torrey pines, a unique species found nowhere else, the land was barren, covered only with low brush. Where repeated fires had destroyed the brush cover, the cattle of neighboring ranchers found free pasture. Water for irrigation was not to be had. The scant rainfall of ten inches annually was the only available moisture except the city's distant water main.

Those eleven dry square miles were given into the hands of Max Watson, graduate of a forestry school, to reclaim. No one dreamt of farming the land; no one dreamt of reclaiming men with its aid. An attempt was to be made to grow eucalyptus trees, to determine whether the meager rainfall was sufficient to produce a crop of fast-growing hardwood timber.

Watson was sanguine. He had seen

FOREST OF EUCALYPTUS AND TORREY PINES ON SAN DIEGO'S MUNICIPAL LANDS.

MADE NO IMPROVEMENTS, BUT DISPOSED OF IT FOR $2,000 AN ACRE.

apparently impossible feats performed on dry land with modern moisture-conserving methods. In the fall of 1910 he cleared fifty acres. After the first rain he plowed the land, not the usual four inches but almost a foot deep, allowing the rains to penetrate far into the soil. In March he set out 40,000 eucalyptus trees, none higher than a foot. Then he put a waterproof blanket of dust over the moist soil, cultivated it five times between March and June.

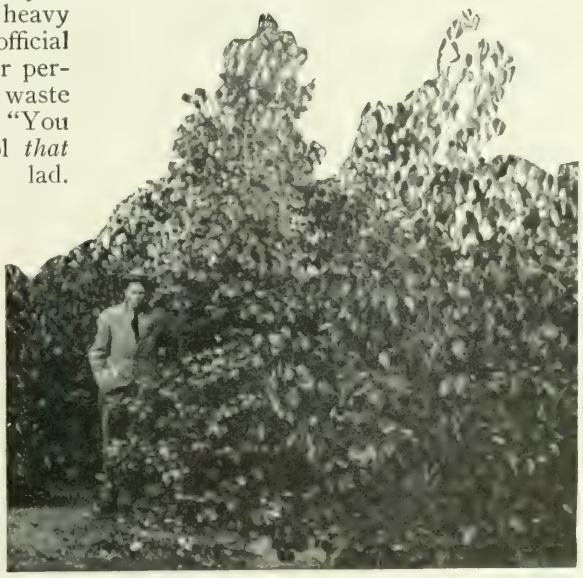
A year later the trees on cultivated land were eight to ten feet high. On uncultivated plots they barely reached four feet. Watson started a nursery with a capacity of 300,000 trees, including seven varieties of eucalyptus, acacias, Torrey pines, palms, ornamental shrubs and bushes. In the fall of 1911 he prepared for the spring planting. That winter San Diego lived in hysterical fear of the unemployed who wandered about the streets.

No, the statutes prescribe no punishment for the crime of losing one's job. But—"You ain't big enough, heavy enough," protested a uniformed official when the pueblo forester asked for permission to farm part of the city's waste land with the aid of the jobless. "You need a club and a gun to control *that* crowd. They'll manhandle ye, lad. Better leave 'em alone."

The pueblo forester smiled and said nothing. True, he was below the minimum weight required of a policeman, but he was not afraid of the ragged, bearded men whose stomach walls were wrinkled like unto accordion pleats. Without formal sanction he went ahead, bought farming implements, seeds, provisions, put up tents and announced that jobless men would be given work on the municipal farm in ten-day periods at fifty cents a day and three square meals.

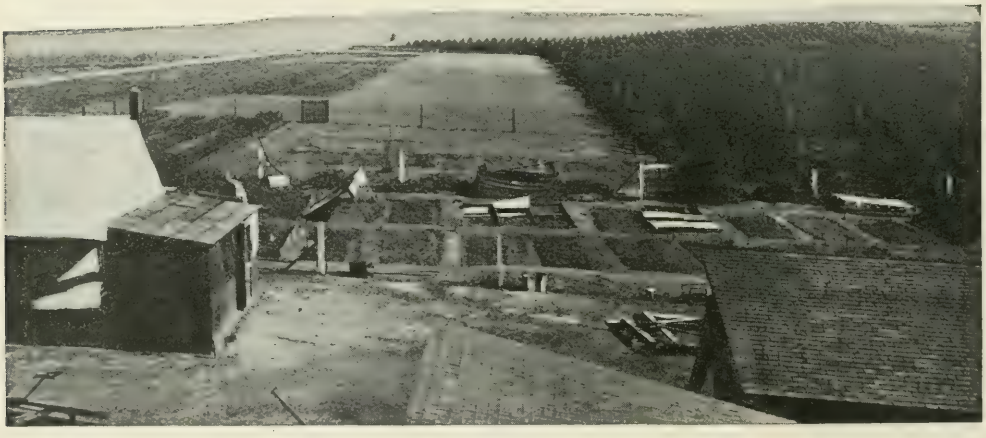
Among the first ones to arrive at the camp was John Deering. With five others he *walked* ten miles to obtain work at fifty cents a day. Nor did he leave at the end of the allotted period. The forester, moving unarmed, without uniform, guard or polished badge among fifty of "that crowd," chose Deering as foreman of the ragged army, retaining him until the man chose to go forth again.

During the winter of 1911-12 five hundred men voluntarily made their way to the municipal farm. Had the city arrested them as vagrants and thrown them into jail, their apprehension, trial, transportation and board would have cost the taxpayers a minimum of five dollars a prisoner. Greater, infinitely greater, would have been the cost to the men through loss of self-respect, through the stigma of a jail sentence, through the degrading influence exerted by every penal institution upon its inmates. In jail, on the streets the jobless man was a liability, a burden upon the community



THE FORESTER AMONG HIS TREES.
The value of the timber's annual growth is equal to the total expenditures of the farm.

THE KITCHEN ON SAN DIEGO'S FARM.



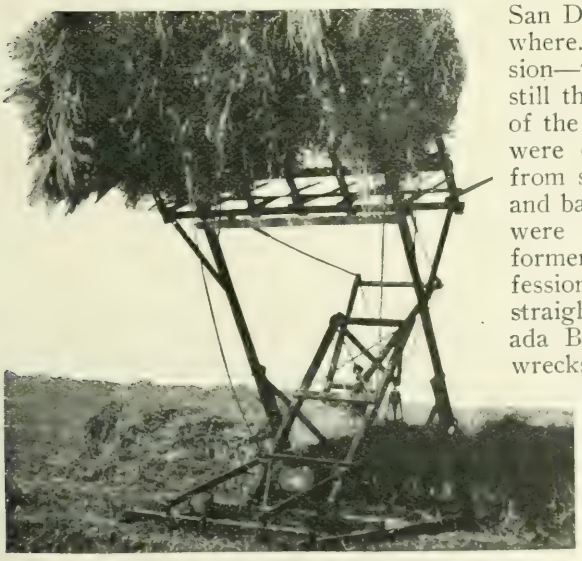
A SECTION OF THE CAMP AND THE FOREST.

A GENERAL VIEW—THE FOREST, THE CAMP AND THE FIELDS.

which might become permanent. On the municipal farm the unemployed became a positive asset. Their work—at fifty cents a day—produced 225 tons of oat hay worth twenty dollars a ton in the San Diego market. This hay alone, grown on land which never before yielded a crop, nearly covered the wages of the five hundred men. On half an acre of land they grew enough green peas to pay the cost of several weeks' provisions for the entire camp. On dry land looked upon as worthless they raised all the pink and lima beans consumed in the mess tent, leaving a surplus of seven tons worth $600 when the season was over. They produced all the vegetables the cook needed and left behind them a hundred gallons of canned tomatoes put up under the guidance of the versatile forester. They cleared several hundred acres of brush land, built miles of new roads and, in addition, the unemployed planted 300,000 young eucalyptus trees.

Ever hear of a discharged jail inmate corresponding with the jailer to keep the official informed of his whereabouts and progress? Dozens of the men whose sole offense consisted of an unsatisfied appetite wrote to the pueblo forester last summer, gratefully reporting their rise up the incline.

Society instinctively fears the hungry man. It scents the potential danger to property rights dwelling in an empty stomach. Hitherto it provided a few soup kitchens, more jail space and heavier clubs to cope with this danger. The soup, the club and the jail, by weakening the moral fiber, increased the speed of the descent. By their use during industrial crises society habitually tightens the safety valve. On San Diego's municipal farm self-respect is preserved, the stale institutional odor is blown to the four winds, the dangerous pressure is transformed into useful motion and applied to the soil. The worker needing a job and the land in need of labor are brought together at an expense ridiculously small compared with the beneficial results. Since the municipal farm was started two years ago the annual expenditures have been less than $9,000; the increase in the value of the eucalyptus timber growing on three hundred acres practically covers this amount, leaving the varied products of the farm proper as profit.



Baling Hay on the Municipal Farm.

This forest, these cultivated fields are on land pronounced worthless without irrigation. Is waste land so rare in a country which has less than twenty-five per cent of its surface under the plow that the jobless man must of necessity be treated as a potential criminal?

Early in the summer of 1912 the problem of the unemployed ceased to worry San Diego. Work was abundant everywhere. The Slide was out of commission—temporarily. But the cesspool was still there. In it wallowed the parasites of the social body. Rudderless derelicts were drifting 'round the endless cycle from saloon to court, from court to jail and back to the saloon. The job-seekers were gone, but "Whiteline Jack," a former printer who had earned his professional name by his appetite for straight alcohol, remained; nor did Canada Bill, Slippery Jim, scores of other wrecks attempt the climb. Why not try and drain this bog by means of the municipal farm?

Judge Puterbaugh, the white-haired magistrate of the police court, and the young forester determined to make the attempt. Again uniform officialdom shook its head dubiously. "They're

goners. No use to monkey with 'em," was its verdict. "They'll loaf around for ten days, fill their bellies, draw their five-spot and get full again."

The forester and the judge admitted that this might happen. But, they asked, did the jail ever stop the derelicts' spiral dip to the potter's field? Was it not worth while to try a new remedy?

No, answered the uniformed ones.

Nevertheless the forester and the magistrate thought it worth while to put their heads together.

One by one, as the old customers drifted into court, they were jolted with a stiff sentence, suspended on condition that they go out to the municipal farm and work. Pathetically eager, the drifters seized the chance. Out to the farm they trudged without official escort, mingled with the unemployed and went to work in the ranks, on equal terms, with no more restraint or supervision than those who came of their own volition. Many of them slid back. Years of the dreary round had broken their moral backbone, but there were others who clung to the redeeming soil with unexpected tenacity. Whiteline Jack, the alcohol fiend, staid at work for three months, sacrificed his only coat in beating out a brush fire. Nor did he go back when his period of probation expired. He formed a partnership with a landscape gardener ruined by sickness and drink; the pair leased a small plot of privately owned land and proceeded to clear it for the production of vegetables, berries and chickens, putting in a few days at the municipal farm now and then for their board. Eight months ago the two were wallowing in the mire, seemingly beyond redemption. Today they have a stake, a purpose in life that helped them to conquer the craving for stimulants.

Look at the Bishop. Twice he crawled out to the sunny acres of the municipal farm, to the ridge swept by the cool trades of the Pacific, and twice he stumbled back to the fumes of the barrel house. Before alcohol seized him, he had filled the pulpit for fifteen years. Despite his backsliding, he had grit. At the urging of the judge he took a cure, destroyed the appetite before he came out to the refuge for the third time. He is now paying for the treatment out of his wages at fifty cents a day, and doing it cheerfully.

Lawyers, physicians, engineers, clerks, men of all classes and vocation were taken out of the gutter to the sunlit acres between the blue sea and the purple mountains. Many, very many gravitated back to the slime, but not a few staid on solid ground. Their number will increase when the tentative plans for the medical treatment of inebriates have been perfected.

San Diego's municipal farm is a paying investment. There is profit for the city both in the forest and in the fields, in the land reclaimed from a sagebrush waste. By far the greatest profit, however, lies in the byproduct, in the redemption of human wrecks out of the gutters of the city, in the fact that the farm at all times offers a place of refuge to the jobless man whom pressure from above is forcing into the social sewer.

Is there no waste land, no human waste to be jointly reclaimed by other cities?

THOMAS A. EDISON AND RALPH H. BEACH BESIDE THE NEW STORAGE BATTERY CAR.

FIRST STORAGE BATTERY TRAIN

By

BERTON MILLER

"DID you come in on the Weary?"

"You mean on the Erie? No; I was in a hurry—I walked."

This old vaudeville gag, as well as the innumerable off-stage jokes at what was formerly an unprogressive railway system, will soon be utterly inapplicable. In fact, it hardly applies at the present day, when the Erie system is making such efforts in practical, up-to-date efficiency, with its prize sections of track, its new cut-offs, and its modern locomotive practice.

But those vaudevillians and others—not yet awake to this new condition of affairs—will be surprised to learn that the Erie is the first steam railway system in the country to adopt the storage battery plan of traction for regular trains, and that before the winter is over it will have in operation a five-car train run by stored electricity. To the much-scoffed-at Erie belongs the honor of the first try-out of a storage-battery train in the world. This train, built for a Cuban railway, consisted of three cars equipped with Edison storage batteries. They were all good-sized passenger cars, each seating forty persons. The train was equipped with a unique system of multiple-unit control and was driven by electricity stored in 210 battery cells. Beside there were twenty cells in each car for lighting it and energizing the master-control. After the first storage-battery train in the world had been tested on the Erie it was sent on a 52-mile spin from New York to Long Beach, Long Island, over the Pennsylvania's Long Island branch line.

The train was driven by a unique system of magnetic multiple control which could be operated from either end of any car by a master controller on each platform and was capable of four speeds. This sequence of operations takes place simultaneously on each car, as each bears its burden of driving, and is accomplished through the "train line"—two wires that run through all the cars and are connected to all master controllers and relays.

The motor equipment of the train consisted of four 200-volt, 37½ ampere motors connected by bar and pinion with the hubs of the driving wheels. The cars, each of which weighs 37,000 pounds, are vestibuled and are built of wood on an underframing of steel. The twenty-six mile run to Long Beach was made in exactly fifty-two minutes. The speed at times exceeded thirty miles an hour.

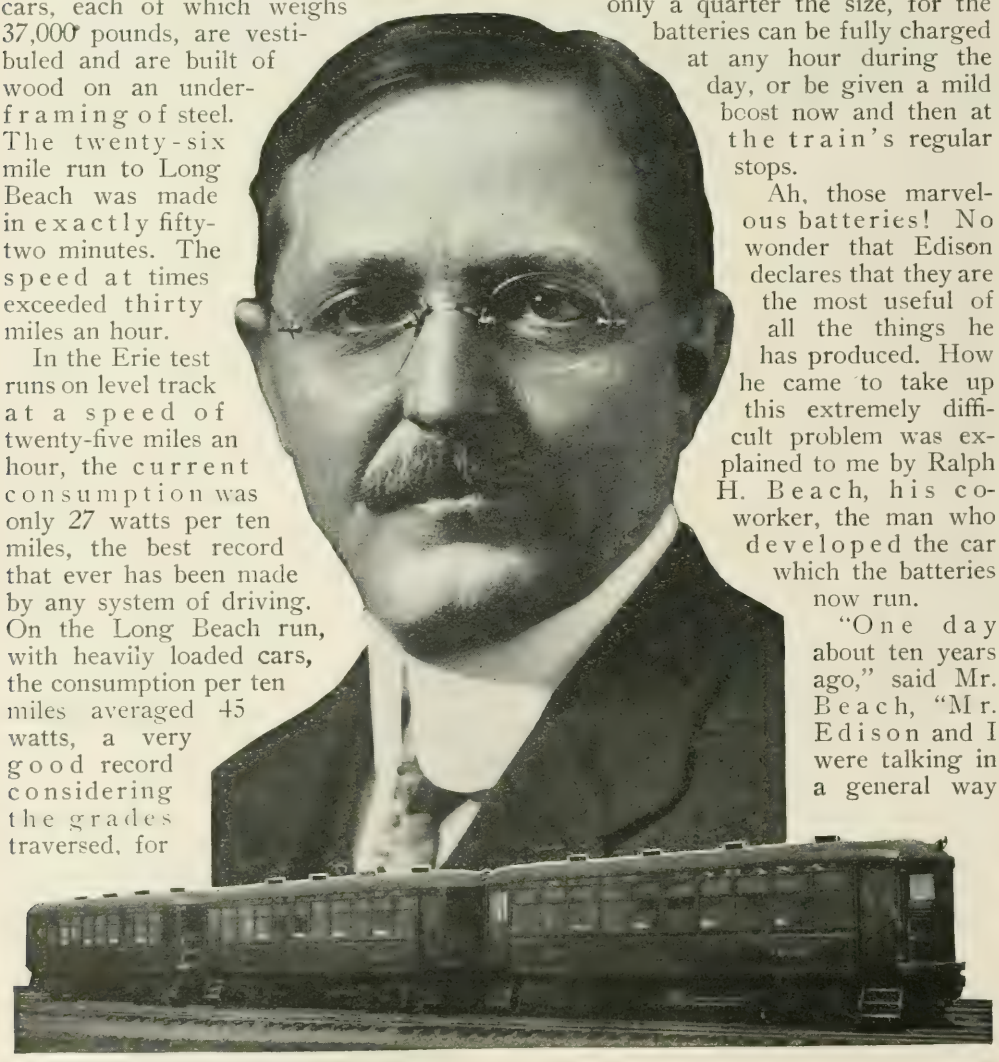
In the Erie test runs on level track at a speed of twenty-five miles an hour, the current consumption was only 27 watts per ten miles, the best record that ever has been made by any system of driving. On the Long Beach run, with heavily loaded cars, the consumption per ten miles averaged 45 watts, a very good record considering the grades traversed, for the average trolley car consumption is 125 watts.

"This beats steaming, trolleying, or third-railing all hollow!" cried an electrical engineer who was among the passengers on the Long Beach trip as the train shot through the East River tube. "There would be no peak hours on a road running trains like this."

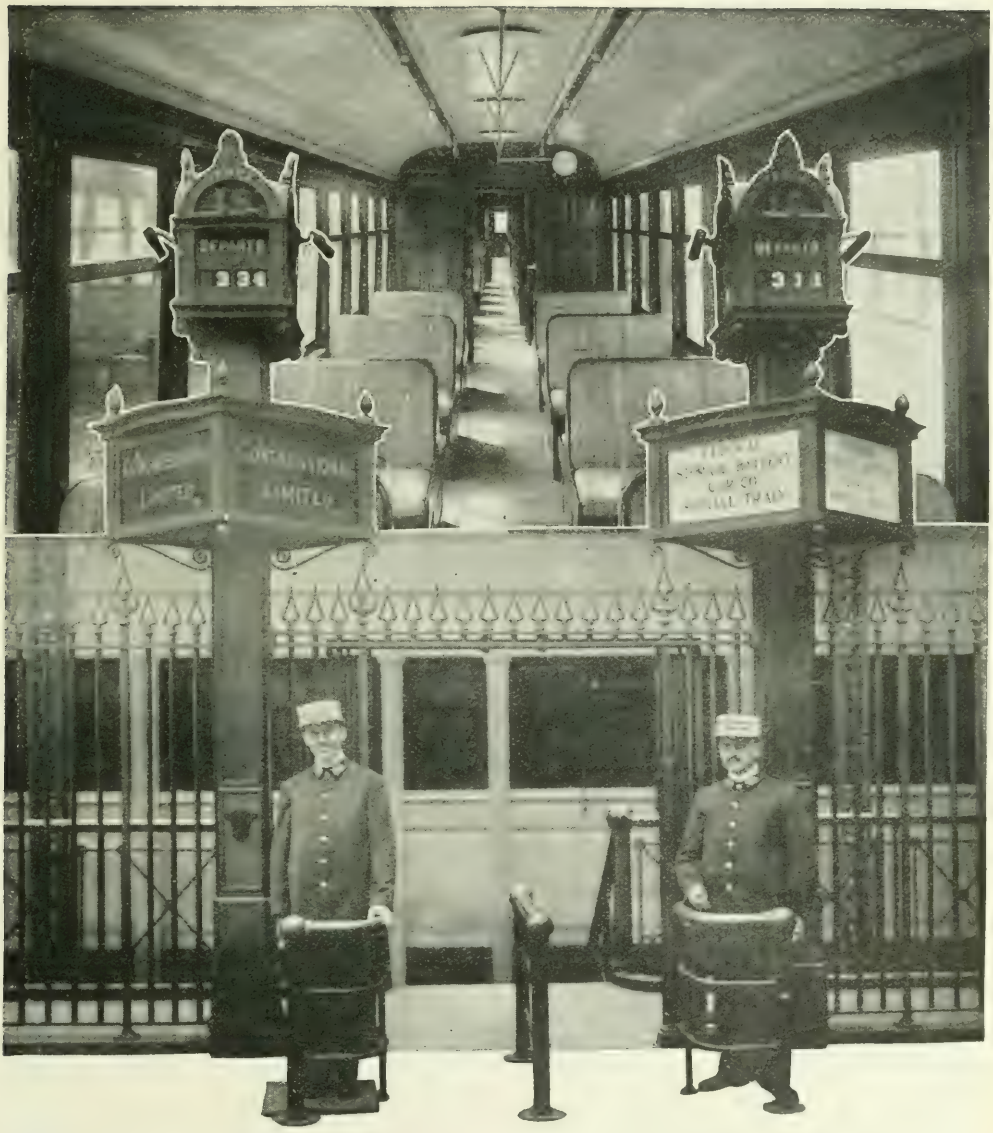
Peak hours are the *bete noir* of the old-style electric railway managers. They mean the apex of current consumption when travel is heaviest. Now they will be done away with and instead of building enormous power-houses just to accommodate rush travel, they need be only a quarter the size, for the batteries can be fully charged at any hour during the day, or be given a mild boost now and then at the train's regular stops.

Ah, those marvelous batteries! No wonder that Edison declares that they are the most useful of all the things he has produced. How he came to take up this extremely difficult problem was explained to me by Ralph H. Beach, his co-worker, the man who developed the car which the batteries now run.

"One day about ten years ago," said Mr. Beach, "Mr. Edison and I were talking in a general way



RALPH H. BEACH, THE MAN WHO DEVELOPED THE EDISON STORAGE BATTERY CAR IDEA.



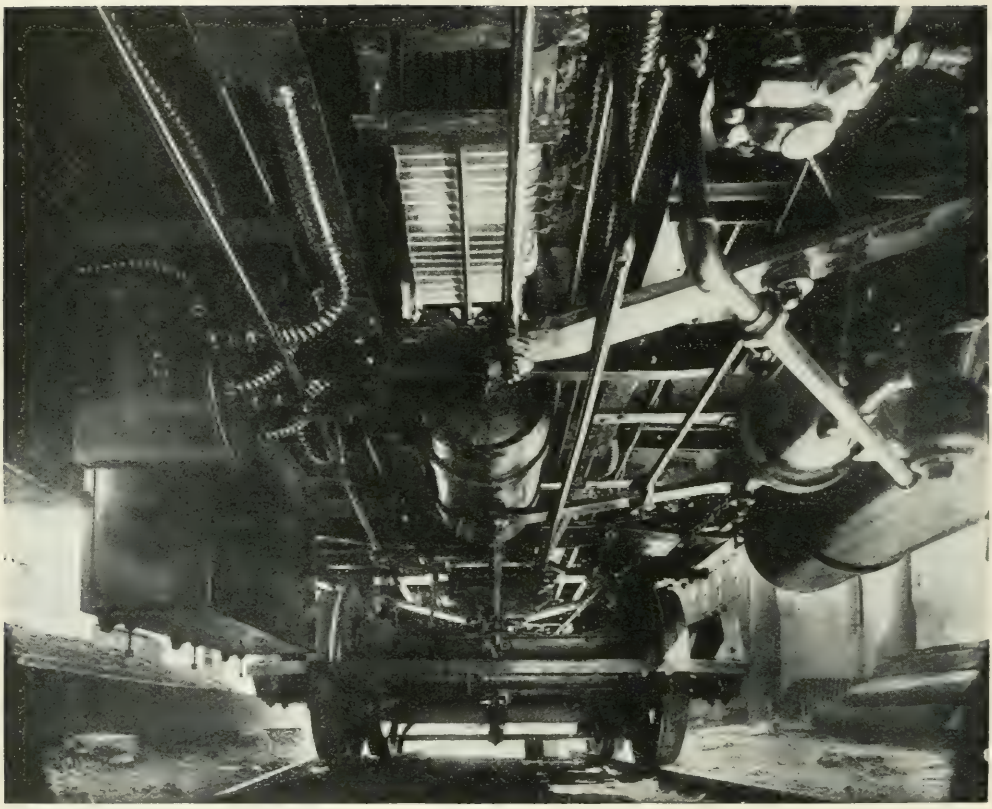
IN THE PENNSYLVANIA TUBE, NEW YORK CITY.

about storage batteries, and he was lamenting that a really reliable battery did not exist.

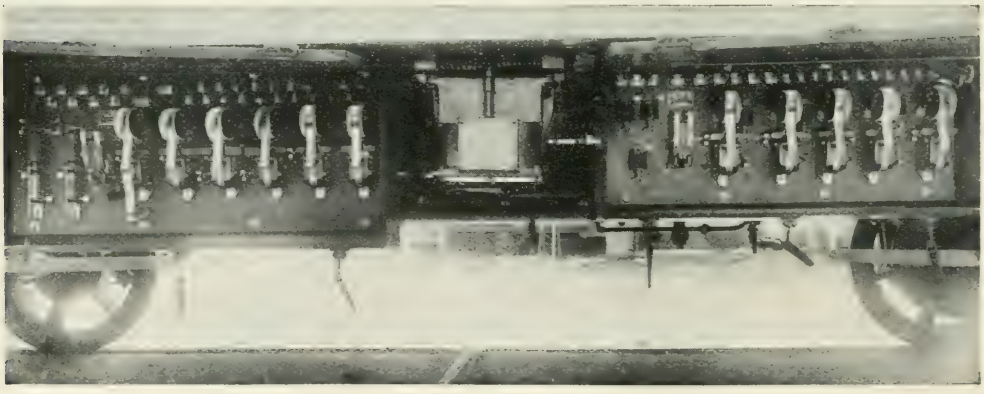
"'I don't believe,' said Edison, 'that Nature would be so unkind as to refuse to give up a durable battery if someone would really search for it. I am going to make the search,'" he added, with whole-hearted earnestness.

I asked Mr. Beach to explain the battery and its operation, in the most concise terms possible. He smiled—Beach is one of those sunny, unruffled, middle-aged men who are always smiling—and repeated:

"The most concise terms possible? That's summing up a whole book in a few words, isn't it? Well, it consists of cells containing a solution of potash and water in each of which are two plates, one of nickel, the other of iron, insulated from each other. If an electric current is passed through the iron to the nickel plate, the oxygen present in the iron oxide passes to and remains with the nickel oxide. A conducting circuit is



MOTORS AND AIR BRAKE UNDER THE CAR.



THE RELAY BOXES UNDER THE CAR.

established between the two plates. The iron thus receives oxygen and in so doing develops heat and electrical energy. While it is receiving this oxygen, which passes to it from the nickel oxide, it is said to be discharging. It requires energy to remove the oxygen from the iron oxide and upon the return of the oxygen to the iron, energy is developed. As an analogy, it requires energy to lift a weight and in falling the weight develops energy. These are the essential principles of the Edison storage battery."

I had the good luck recently to travel in one of the Edison-Beach cars from Hoboken to Silver Lake, New Jersey,

over the Erie, with Mr. Beach. We ran out of the yards and over the Newark marshes lying sere and brown under a clear autumn sky. Beside us ran the Pennsylvania tracks, with their great lumbering third-rail locomotives. From the windows of the cars the passengers gazed curiously at our novel equipment, the forerunner of a scheme of things that would sweep third rails and trolleys off the great highways, and I felt an exceeding great pride in being a part, though an inconsiderable one, of a traction concern that was making history. Standing by the motorman and looking forward over the marsh toward populous Newark and the hazy Orange Mountains beyond, I learned many things while Mr. Beach talked of his cars and of what he was doing with them. He said that a speed of forty miles an hour had been attained in some of the tests, that the cars could go up a thirteen per cent grade quite easily, that the batteries would last many years, that the water in them will not freeze till a temperature of fifty degrees below zero is reached and that then the ice is only mush and is quickly melted by the electricity; that the cars had been run from Jersey City to Atlantic City, a distance of 135 miles, on a single charge of the battery and had enough current left to run forty miles more; that the cost of power for driving the new cars was less than the maintenance of an overhead trolley and rail bonding, that there was no magnetization from the batteries to the car interim, and that the operation of a storage battery railway eliminated all electrolytic difficulties common in cities and towns. He told me a great many other interesting things, and when we reached the Silver Lake shops he showed me cars that were built for near and remote places. It was all very illuminating, but I wanted to see Edison and hear what he had to say about the possibilities of storage battery cars in a big way. So I got into an auto and whizzed over to West Orange, where the ivy-covered laboratory of America's greatest inventor soon loomed before me.

"What is the future of storage traction?" The kindly blue-gray eyes of Edison twinkled as he stood before me in his laboratory. Then they took on a far-away look as he gazed out of the windows upon the Orange Hills ablaze with autumn reds and yellows. "Big things will come from that, not immediately, perhaps, but before long. Just now they are preparing to use storage battery cars in a pioneering way—a splendid field for that system of traction. You see, it costs a lot of money to run a steam railroad, even a short one, through a mountain country. In the first place you must go a long way around to establish your grades, and then you must pay out a lot for locomotives. Now these storage battery cars will run on almost any wagon grade. A ten to twelve per cent rise presents no difficulties, and they are building one that is even steeper than that out in California.

"For suburban traffic the storage battery train or single car is well adapted. A great many roads will be built for their use in places where it wouldn't pay to build a steam railway, a trolley line, or a third-rail system. The cheapness of them appeals to capitalists who have been discouraged when they came to count up

CONTROL AND AIR BRAKES.

the cost of other means of traction."

"But about high-power traction," I asked, "and speed? Will the storage battery system ever be used for long-distance express trains?"

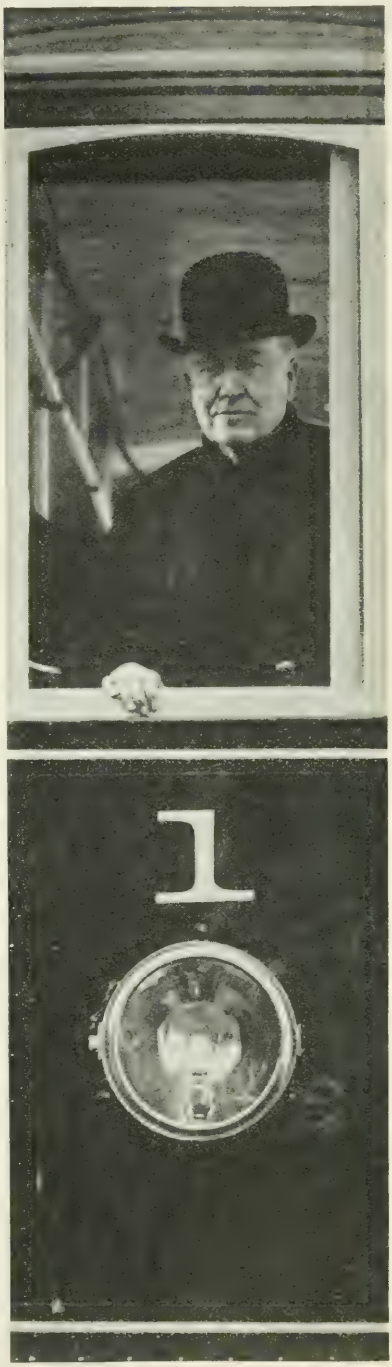
The blue-gray eyes gazed further away than ever, as if they saw down the long vista of mile posts waiting future years.

"Why not?" His finger-tips stroked back the white hair from his brow. There was another silence, then he repeated the words as if to himself. "Why not? New York to Philadelphia. There is nothing impossible in that. I shouldn't like to say what I have in mind on that subject. Perhaps it's only visionary."

"But you believe in your visions; they must have been very real to you."

The old man smiled and nodded. Then he brushed some laboratory dust from the sleeve of his blue serge suit and said:

"On fairly level roads we could probably run fast express trains now, but it's going to be some work to perfect the system. Mr. Beach has devoted a lot of time in that way. He is a very capable man, and he has done remarkably well. We have worked together—he on the application of the power and the driving possibilities, I on the improvement of the batteries and the controlling principle, but there is a lot more to do before we get down to the big express train business."



EDISON IN THE STORAGE BATTERY CAR.

"Then perfection"—I began eagerly, as the vision of what this meant opened before me.

"There's no such thing as perfection," he said, "in science, art or anything. Take music. It isn't perfect, because the means of producing it are imperfect, even the highly trained human voice. But as for storage battery traction, I consider it far enough developed to say that for local passenger traffic in and out of cities or smaller places, it will probably supersede other means of traction. As for long-distance express service, we may have to wait a while for that. Time will tell what can be done in that line."

But in the meantime please remember that the oft-derided Erie, the railway vaudeville joke of America, is to be the first line in this country to run regular storage battery trains. And meantime there is little Cuba with her three-car train, the first in the world. Let's give her credit, too.

So here for the present the narrative stops, but it is by no means ended. The inventors had spoken with an enthusiasm that even scientific caution could not quite suppress. One had only to supplement their words with the bright glow in their eyes to understand that they had tremendous hopes of accomplishing a remarkable thing.

THE FERRYBOAT

By

BERTON BRALEY

THE haughty liner swaggers by and hoots her scorn of me,
For she will buffet combers high and cross the open sea,
And she's "the grandest thing afloat" as all the world may know
While I am but a common boat that shuttles to and fro.
And yet—she needn't be so proud, for in my humble way,
I carry twenty times her crowd and do it every day;
So let her mighty engines throb and let her siren shriek
I'm doing just as big a job through all the busy week!

Back and forth, back and forth,
Morning, noon and night,
Unromantic, commonplace,
Clumsy to the sight,
Keeping up the city's life—
Work and love and fight!

The tug-boat scutters 'round about in search of work to do,
The motor-boats dodge in and out the course that I pursue,
And ugly groups of barges drift adown the river wide
Or frowsy-canvassed schooners lift their anchors from the tide.
They know adventure now and then; the new, the quaint, the strange!
I only serve the need of men with never turn or change.
And yet of this much I may boast—with never-tiring toil
I carry forth the human host to labor—or to spoil!

LOADING BARRELS WITH REFINED SUGAR.

OUR GREAT SUGAR DEBAUCH

By

BAILEY MILLARD

HOW much sugar do you eat in a day? More than four ounces? If so you are one of the many millions in this country who are consuming too much sweet, and a fine, large assortment of special diseases is due you, among them the great American malady, dyspepsia. Scientists have settled it that three to four ounces should be the daily limit of cane or beet sugar in any form eaten by the normal adult, and that if you exceed this allowance the impairment of your organism will, in due course, surely follow.

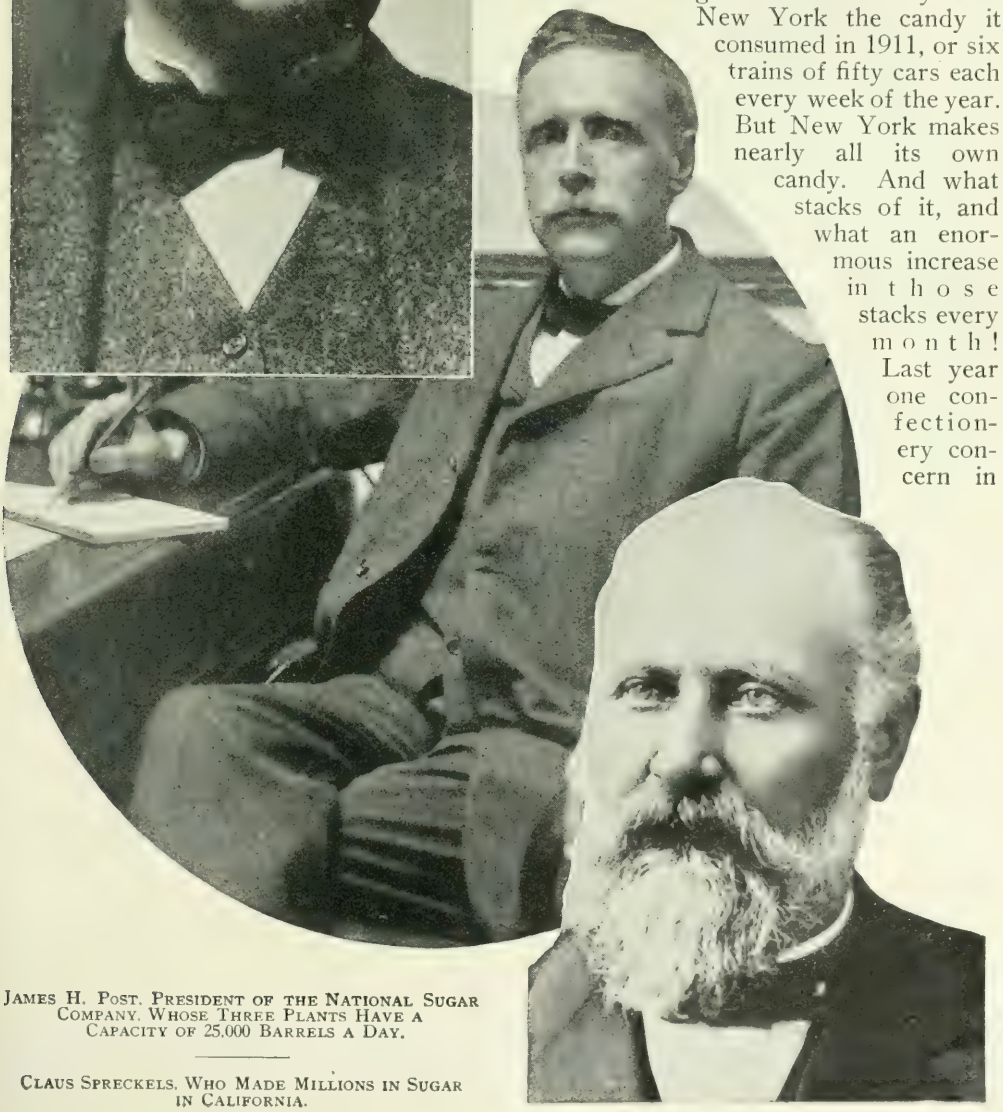
Travelers from across the Atlantic are amazed at the amount of sweets we consume. And it is no wonder that we set them staring, for our annual per capita consumption of commercial sugar is said to have reached eighty-five pounds, *or nearly five times that of the average European,* not taking into account the syrup and honey used every morning on our griddle cakes.

Now, mind you, sugar is an essential food for the blood, but a sparity is better than an excess. Most of us it would seem are trying to assimilate more than our four-ounce allowance per day, which, Science says, is a physical impossibility, for just as the human organism will absorb so much iron or so much sodium, so will it absorb so much sugar. Now, as the per capita consumption of sugar in this country has jumped up *nearly six fold* since 1865, when it was only eighteen pounds annually, and as it is increasing by leaps and bounds every year, it certainly would look as though our national sweet tooth, which modern dentists say is anything but a sound one, is getting the better of us, like a drunkard's thirst. One has but to note the enormous increase of the candy trade in this sweet-gorging country to be assured of our

H. O. Havemeyer, Father of the Eastern Sugar Industry.

sugar intemperance. Indeed, it is more than mere intemperance. It is a debauch.

Folk who dwell in big cities are the worst transgressors against the excess sugar laws. It is estimated that our urban population consumes from 100 to 125 pounds of sugar per capita each year. Take New York as an example. Here is a city which, with less than one-twentieth of the total population, consumes over one-tenth of the candy eaten in the United States. It would have taken fifteen thousand freight cars to carry into New York the candy it consumed in 1911, or six trains of fifty cars each every week of the year. But New York makes nearly all its own candy. And what stacks of it, and what an enormous increase in those stacks every month! Last year one confectionery concern in



James H. Post, President of the National Sugar Company, Whose Three Plants Have a Capacity of 25,000 Barrels a Day.

Claus Spreckels, Who Made Millions in Sugar in California.

that city, making 150,000 pounds of candy a day, doubled its capacity and is now turning out over 200,000 pounds a day. Other cities are increasing their candy output amazingly. In St. Louis, a confectionery company, lately capitalized at $9,000,000, has big new factories in Chicago, Louisville, Buffalo and fifteen other American cities and is turning out thousands of tons of sweet stuff to satisfy our morbid and inordinate taste.

PHOTO UNDERWOOD & UNDERWOOD, N. Y.

LAUNCHING RAW SUGAR ON THE DOCKS AT NEW YORK.

A visit to a big modern candy factory opens the eyes of one who has witnessed only old-fashioned hand methods of confection-making. Most of the work is now done by huge machines the daily output of which staggers the imagination. The grinding out of chocolate drops, marshmallows and caramels and the array of sweets in sight is truly prodigious. One gets such a surfeit of sweets and of sweet smells as to last a month. And yet the girls employed in such places seem to be eating candy all the time. As a rule, they are not a healthy-looking lot, and, though plump enough, are pale of cheek and listless of eye—sugar inebriates all, with bad stomachs, and bad livers.

"I consider," said a New York dietetic expert to me the other day, "that the candy store in the middle of the block does more harm than the two saloons on the corner." An extreme statement, perhaps, but there are years of observation in an extensive medical practice behind it.

Insidious is the growth of the confection trade, fostered as it is by all the lures of the clever ad. writer who knows how to appeal to the lover of sweets, as the whiskey advertisers know how to appeal to the lover of liquor. Here is a lump of wisdom from a street-car placard I saw the other day:

"Children Must Eat Candy.

"Grown-ups Should Eat It, Too.

"Candy is a Valuable Food."

Now, as a matter of dietetic fact, Children Must Not Eat Candy, that is, the kind of candy generally exposed for sale in the average shop. Of 250 samples of such candy bought in the open market for examination by government chemists, not one was found to be pure, and nearly all had either aniline or coal-tar colors, glucose or terra alba in them, while many had all of these "valuable food" elements. Even if all candy were pure—that is, if it were composed wholly of sugar, mixed or coated with other edible constituents—it would be unsafe for the average child to gorge himself with it, and it is difficult for the average child to keep from gorging if he is permitted to buy his own candy.

Natural love of sweets must be gratified? Yes, but not with cane or beet sugar between meals. Your child is likely to get more of that kind of food at table than is good for him. Let him eat freely of the inverted and easily assimilable sugars afforded by such foods

as dates, figs, or prunes, but don't let him load up with the sugar of commerce if you wish to keep him out of the doctor's hands.

The quantity of syrup consumed in cheap city restaurants is incredible. Many a factory girl and department store saleswoman makes her entire luncheon from starchy wheat cakes swimming in "maple-cane" or "corn" syrup, and no other dish. For the matter of that, most Americans satisfy part of their inordinate craving for sweets by the same sort of food at the home breakfast table. This practice is almost unknown in Europe, where they have better digestions than ours. The pan-cake-and-syrup habit is helped along by the advertisements of the lithographed "stack of hots" upon which the tempting syrup jug is being emptied. Taken in moderation, this sort of food does no greater harm than an occasional glass of wine or beer, but the way the Americans tap the syrup keg is anything but moderate. Out at Rocky Ford, Colorado, not long ago they paved a road with molasses and the experiment proved quite satisfactory, as the surface is free from dust and hard as macadam—surely a better use for this "valuable food" than to pave your pancakes thick with it every morning.

GENERAL PACKING ROOM FOR CANDIES IN A BIG FACTORY THAT MANUFACTURES SWEET DAINTIES.

THE PHILADELPHIA PLANT TURNS OUT 10,000 BARRELS A DAY.

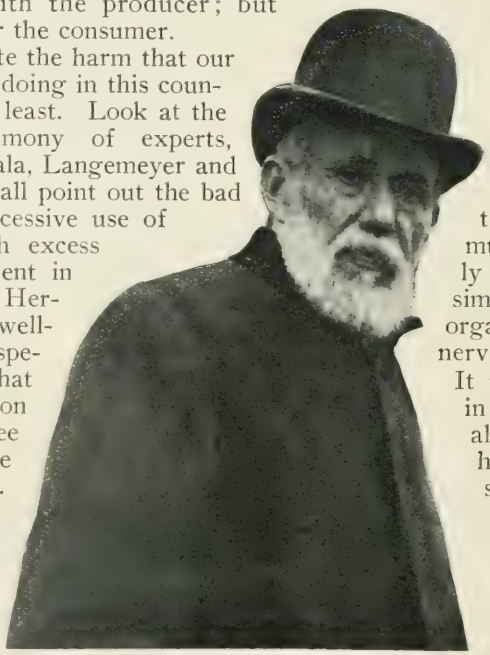
THE BOSTON PLANT HAS A CAPACITY OF 6,000 BARRELS

If we are to use wrongfully the big supply of sugar that nature has deigned to favor—or to curse—us with, the ravages of insect pests in the sugarcane fields, that Southern growers complain about, may not be an unmitigated evil. It goes hard with the producer; but it augurs well for the consumer.

Do I exaggerate the harm that our sugar debauch is doing in this country? Not in the least. Look at the voluminous testimony of experts, such as Willis, Sala, Langemeyer and Atkinson. They all point out the bad results of the excessive use of sweets—just such excess as is now prevalent in this country. Dr. Herman Partsch, a well-known stomach specialist, declares that the average person eats about three times as much cane sugar as he should. The sugar bowl is banished from the table of his patients, many of whom regain their health by said banishment. For the same product he substitutes dates, figs, prunes and honey.

I am well acquainted with the case of a California experimenter named Morrison Pixley who went without sugar for three years and not only regained his health, which had been reduced by dyspepsia, but declared that he could do more manual and mental labor without sugar than with it. Mr. Pixley has written a monograph in which he advises everybody to eat very little sugar. "I would as soon think of giving slow poison to my children as candy," he once said to me. "Candy produces an insatiable desire for more candy. The child builds up a bad habit and in time he suffers for it."

It is true that in the German army young men, who doubtless started with good stomachs and large powers of sugar assimilation or resistance, have withstood the effects of long marches on a diet of sugar alone. But this was on single trials. I would give very little for the fighting ability of well-sweetened warriors who continued this practice for a term of months or even of weeks; for a man might as well try to live on alcohol alone as on sugar. In fact these two elements have very much in common chemically and produce somewhat similar results in the human organism, that is, heat and nerve stimulation.



THE LATE SUGAR KING, JOHN ARBUCKLE.

It is becoming the practice in this country to give large allowances of sugar to horses. In the Catskills a stage driver told me that his employer fed each of his horses ten lumps of sugar with every meal. "If they were my horses," remarked the driver, "they'd get none. For they all

have bowel complaint, which they didn't have before they were fed sugar, and are exhausted much quicker than formerly."

But how about that four-ounce limit for the human adult? How is it arrived at? By exhaustive experiments made by such European food experts as Langemeyer and Mosso, who have found that a man, particularly one of sedentary habits, thrives best with even a lesser amount than that.

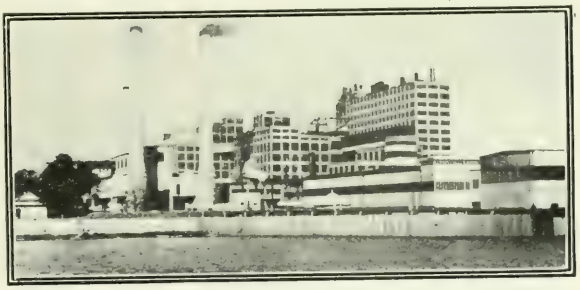
In this country Mrs. Mary Hinman Abel, working as a government expert, has tried to ascertain the precise value of cane sugar as a food. After a long investigation of dietetic experiments by specialists she reported to the Secretary of Agriculture that "the bad effects ascribed to sugar as a food are due to its use in larger quantities than three to four ounces a day." There are thousands of people who eat twice that amount.

On her latest birthday a popular New York society girl received from her admirers no less than eighteen pounds of candy! A big box of confectionery costing from $1.50 to $5, is a common form of gift in swelldom, and it leads to the wholesale consumption of sweets in our smart society. But George T. Surface in his book, "The Story of Sugar," declares that the poor of our cities eat far more candy than the rich. If they do, God help them; for the kind of candy the poor buy is not good diet for a Berkshire pig! But, strange to say, Mr. Surface sees no great harm in candy. He declares that it is a valuable food and that poor people get more nourishment from it than from most of the other foods they are able to buy. As for the evils of candy diet he declares that heavy sugar-eating results in "no organic impairment save indigestion." But as indigestion is the root of so much other organic impairment, this is a queer statement, and I am afraid that Mr. Surface has made but a superficial study of this very deep subject.

Candy costs the people of this country over $500,000,000 a year. We consume more than all other countries combined. Turks, for example, are generally considered heavy sweet-eaters, and yet the annual consumption of sugar in that country, as in Italy and Greece, is only about ten pounds per capita, or less than one-eighth our per capita consumption. Much of the Turkish candy is made of honey and figs, which are far less harmful to the human system than cane or beet sugar.

When we think of our eighty-five pounds of per capita sugar consumption, city and country, and our 100 to 125 pounds of urban consumption per capita, and then consider that this is *about five times the amount eaten* by the average European, who doesn't know what hot cakes and syrup are, it is seen that our taste for sweets is getting the better of

THE JERSEY CITY PLANT PRODUCES 7,000 BARRELS A DAY.



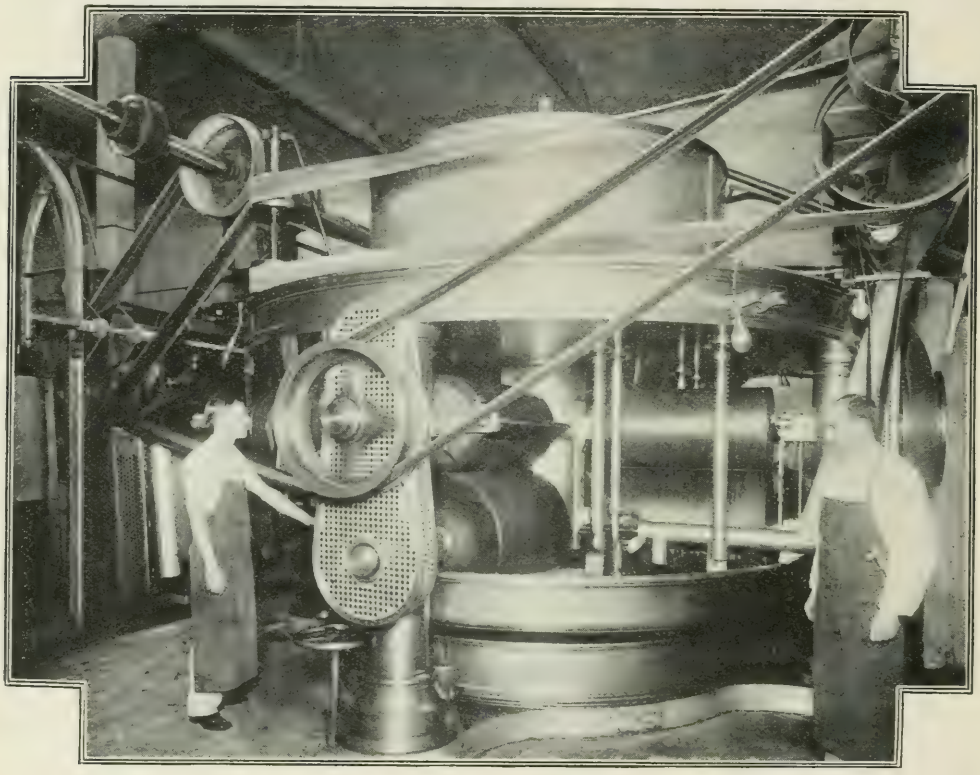
AT CHALMETTE, LA., 9,000 BARRELS IS THE DAILY OUTPUT.

AT THE BROOKLYN PLANT—THE LARGEST IN THE WORLD—12,000 BARRELS ARE MANUFACTURED DAILY.

us. It is not merely an inordinate indulgence. It is, as I have said, a debauch, and doubtless we shall pay dearly for it.

"Sugar," observes Mrs. Abel in her government report, "is concentrated food and therefore should be eaten in moderate quantities. . . . Those of sedentary life would do well to use sugar moderately."

But no more attention is likely to be paid to this report than to any other dietary warning. The Sugar Trust goes on turning out 40,000 barrels a day, the maple sugar manufacturers continue to make 8,000 tons of their annual product do duty for 50,000 tons, and we children, young and old, keep running to the sweet shops.



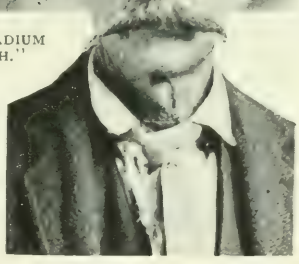
THIS CHOCOLATE MIXER IN ONE OF THE CANDY FACTORIES HAS A CAPACITY OF SIXTEEN THOUSAND POUNDS IN TEN HOURS.

RADIUM MINE IN THE OZARKS?

By

V. H. SCHOFFELMAYER

SEVEN WEEKS' EXPOSURE TO RADIUM PRODUCED THIS "RADIOGRAPH."



WILLIAM BOYCEYER.
Only Survivor of Expedition of 1879 into Radium Mine in the Ozarks.

ONE red and gold November day, thirty-three years ago, three Missouri "hill billies" followed their yelping "hound-dog" up a deep mountain canyon in Barry county, Missouri. They were on the trail of a wildcat. Where the canyon came to an end, blocked by the face of a rocky cliff, the cat disappeared in the black mouth of an unsuspected cave. The hound followed, the hunters waiting outside, their rifles ready. Fifteen minutes later the bay of the dog was heard on the top of the cliff. Plainly the big hole ran clear through the mountain. The hound was whistled down and sent through a second time. Then the four hunters prepared to explore the cavern on their own account.

What followed would, in the days of mythology, have added half a dozen grim and deadly monsters to the ranks of the supernatural enemies of mankind. The story is told by old "Bill" Boyceyer, one of the hunters, who, after more than thirty years, is now living at Chance, Oklahoma. The events of that November day made such an impression on his mind that, in an affidavit made only last March, he is able to recall them in vivid detail.

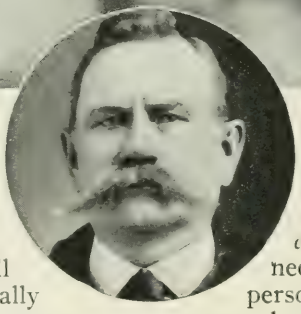
"A little way in from the mouth of the cave "Bill" Henry, John Dempsey and I found what looked to us like rich silver ore. It was growing dusk and we decided to go back to camp, get a good night's rest and return the next day to make a more careful examination. In the morning we lit our pitch-pine torches and started in. About two hundred feet from the mouth the cave was partially blocked by what looked like a big tree trunk of solid silver. It was a light peacock blue in color and glittered like diamonds in the glare of our torches. We filled a small box with bits chipped off this pillar of ore, but it was so heavy we could hardly lift it. Finally we went on further into the cave. Nearly five hundred feet from the entrance we entered a big arched room, the walls of which shone like polished silver. Its roof was supported by three transparent, crystal pillars, each about the diameter of a salt-barrel. The floor and part of the walls were a light-blue, shimmering mineral. We thought we had found our eternal fortunes. Presently we noticed that when we got on the other side of the crystal pillars our torches died down and almost went out. We got scared and hurried back to the mouth of the cave. When we reached the open air I fell down in a heap and was not able to move my legs. Henry keeled over in a

sort of faint and Dempsey commenced to talk wild and raving. The boy we had left to wait for us at the cave's mouth ran for help and finally we were all carried back to camp."

Henry's condition grew so serious that he was taken to a hospital at Carthage, Mo., where he lay for weeks before recovery. Henry collapsed and sores like burns broke out all over his body. Paralysis finally ended in his death. Henry went back, when he got well, to work his "silver mine," but a quarrel over the title to the land drove him away, after he had blocked up and hidden the mouth of the cave. The story of the strange adventures of the three hunters spread by word of mouth among the Arkansas and Missouri hills and finally became one of the grim traditions of the Ozarks.

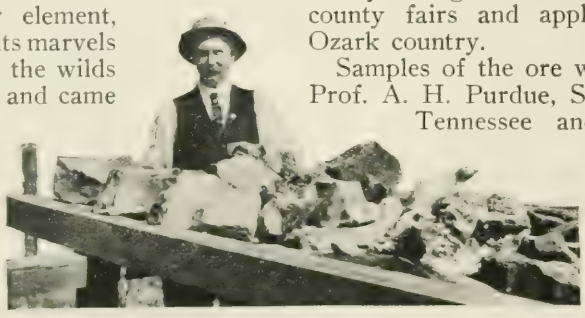
James L. Leib, Who Made Known the Discovery of the Radium Cave.

"Radiograph" Secured From a Five Weeks' Exposure to Radium.



John P. Nagel, Who Is Developing the Find in the Ozarks.

When Professor and Madame Currie discovered, in Paris, the wonder-working element, radium, word of its marvels finally penetrated the wilds of the mountains and came to the ears of James L. Leib, a prospector and self-taught geologist who has grown up in the hills about Bentonville and Rogers. He had heard of the death-dealing cave and, at once, associated it with the terrible powers of the new element. Hunting up old "Bill" Boyceyer in his Oklahoma home, Leib procured from him directions for finding the lost cavern. Taking the necessary precautions to avoid personal injury he entered its mouth far enough to pick up some bits of the strange bluish ore. From Madame Currie, herself, he received directions for making a radiograph, the infallible proof of radio-activity in an ore. With the help of a country photographer in Bentonville he succeeded in making what appear to be perfectly successful and characteristic radio-photographs, several of which are reproduced herewith. The first were made four years ago and were displayed at the county fairs and apple shows in the Ozark country.



James L. Leib, and a Single Month's Output of Radium Ore.

Samples of the ore were submitted to Prof. A. H. Purdue, State Geologist of Tennessee and former State Chemist of Arkansas. By making independent experiments he succeeded in convincing himself that

the samples submitted were highly radioactive and that the discovery of the cave promises great things for the world of science.

In the spring of 1912 the section of land in which the cave is located was bought by John P. Nagel of Chicago, who owns several fruit farms in the Ozarks and for some months development work has been under way. The final verdict on the richness of the find awaits returns from a large consignment of the ore which has been sent for analysis to Germany.

LOG BUNKHOUSE ERECTED ON THE NEW MINING PROPERTY IN THE OZARKS TO GIVE SHELTER TO THE WORKMEN.

The tremendous possibilities involved may be judged by the fact that at present the world's whole supply of radium comes from a single group of mines in Austria, which is owned by the Austrian government and that a gram of pure radium is worth perhaps a hundred times its weight in diamonds.

Blessings light on him that first invented sleep! It covers a man all over, thoughts and all, like a cloak; it is meat for the hungry, drink for the thirsty, heat for the cold, and cold for the hot. It is the current coin that purchases all the pleasures of the world cheap, and the balance that sets the king and the shepherd, the fool and the wise man even.

Cervantes.

A LIFE PRESERVER OF NEW FORM

DORA WOOLARD, a professional diver and swimmer, is herewith shown in a new swimming and rescue buoy. It has been pointed out that every great sea disaster of all time thus far has gone to prove the utter inefficiency of the life-saving appliance with which the vessels have been equipped. The lessons given by these and by a wide experience as a swimmer and surfman aroused the designer of this new apparatus to overcoming the faults of preceding appliances. None of the old-style ones can be made to fit persons of various sizes and of all conditions. The new one overcomes this great defect.

How the New Buoy Looks on the Shoulder.

The one great fault the inventor of the new device had to overcome was the overbalancing that is sure to take place in under-arm appliances when the wearer relaxes from exhaustion or fainting. To overcome this, the inventor decided that the buoyancy must be placed above the shoulders of the wearer and be attached to the person in such a way that it could not be lost and in such a way that the wearer could not be injured by the appliance when he struck the water.

Moreover, it may be put on quickly. Its retention in position in no way depends on sewing in the canvas cover for its adjustment but on non-corrosive and rust-proof rivets which carry the weight of the wearer from the top of the appliance by means of the adjustable under-arm straps.

There is a round form of the swimming and rescue buoy which can be used by the life guards on bathing beaches, who recognize in it a device that robs their humanitarian work of all its attending danger. Its first season's use brought it credit for thirty-seven rescues on the Jersey Coast and seven on Long Island.

WRIGHT MEMORIAL MONUMENT

THE Wright Memorial Committee of Dayton, Ohio, has decided to erect a monument to the Wright Brothers near Simms Station, at a point where the first successful aeroplane flights were made. This spot is called "The Cradle of Aviation." The memorial authorized by the committee will consist of a huge boulder, with cement base and bronze tablets, suitably inscribed, and bearing the faces in bold relief of Wilbur and Orville Wright. The Dayton Memorial Committee is also inaugurating a movement to interest aero clubs of this and foreign countries and other organizations in the plan for the erection of a world memorial to the Wrights.

THE NEW LIFE PRESERVER HOLDS THE BODY UPRIGHT WITH HEAD OUT OF WATER.
Compare with old-fashioned device as shown at right of illustration.

NEW GERMAN PORTABLE MAST

THE portable steel mast—a new German device, designed to be of use especially in war—is mounted on wheels and may be utilized for many purposes, such as wireless telegraphy, as a signal light-stand for the use of search-lights and observation, etc. Two men may be raised by means of it from the ground to a height of seventy-five feet, without difficulty.

The manner of erecting and of taking it down is unusual. Four drums are arranged to feed the four flexible steel bands interlocking at the corners, and forming a four-sided column. Cranks are used for rotating the drums, a hoisting device being employed for the heavy masts. A small ladder is sometimes attached permanently to the plates to enable an observer to climb up or down without difficulty.

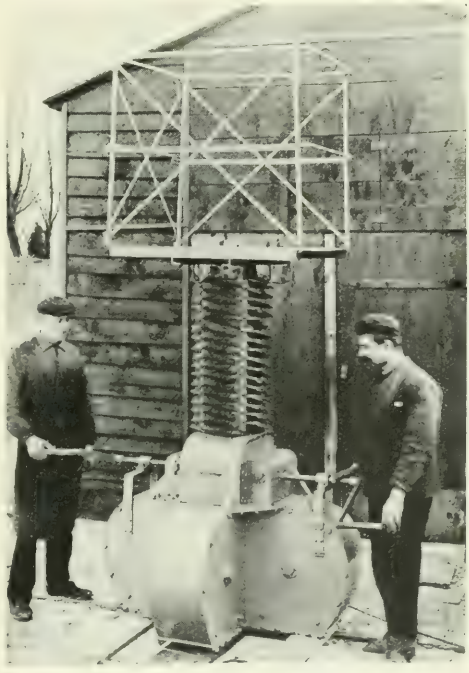
KEEPING A RECORD BY THERMOMETER OF NUMBER OF SOULS "CAPTURED"

A rotary table with chair and table for holding a telephone is also sometimes added as part of the equipment.

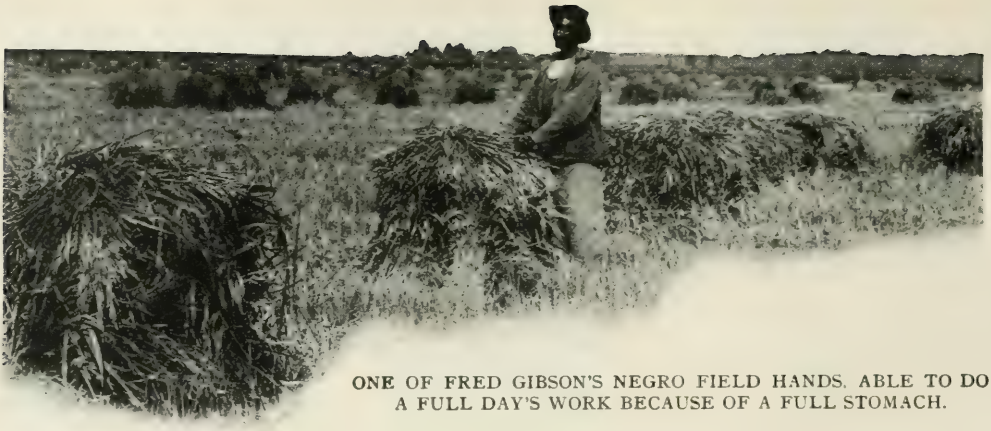
A THERMOMETER OF SOULS

TWO opposing armies of young men recently canvassed England for converts to the Young Men's Christian Association. The picture shows a huge thermometer-shaped indicator, which was erected outside the headquarters of the Association. An hourly record of the number of souls "captured" by each army is thus given. The armies were known as the blue army—its members wearing badges of that color—the other was called the red army, the members of which also wore a suitable emblem by which to readily distinguish them from their rivals.

PORTABLE MASTS IN POSITION.



BEGINNING TO ELONGATE A PORTABLE MAST.



ONE OF FRED GIBSON'S NEGRO FIELD HANDS. ABLE TO DO A FULL DAY'S WORK BECAUSE OF A FULL STOMACH.

SUCCESS OF A BOOK FARMER

By

FRANK G. MOORHEAD

SUPPOSE you were a junior in college, lived with a bunch of congenial fellows at a Frat house, and were engrossed with nothing so much as the forthcoming prom?

Suppose about all you knew of farming was that it necessitated arising in the dark all the year round and working like a dog throughout all kinds of weather?

Suppose, finally, you, suddenly and unexpectedly, inherited a fortune in farm lands?

What would you do?

It is just because Fred D. Gibson, junior in the University of Illinois, arose to the emergency as few boys in his position would rise, so that today he is the largest individual rice grower in the United States, that there is a story behind his exertions in the Grand Prairie fields of Arkansas.

The first thing Mr. Gibson tried to do was exactly what you or I, in his fix, would probably have tried to do: get rid of the land and convert it into money to invest in the business he thought he would like best. But before the land could be sold it had to be improved, it had to be made presentable to the pros-

THRESHING RICE ON THE GRAND PRAIRIE UPLANDS IN CENTRAL ARKANSAS.

pective customer. A fence here, a well there, a new barn another place, better roads, more sanitary farm homes; it was not long before the anticipated riches were taking wing in most vigorous fashion, and instead of bringing in money the land was merely costing money.

It was at this juncture that Mr. Gibson, as he modestly puts it today, decided to "get into the farming game, to see if there was anything in all this 'back to the land' craze for him as well as for the other fellow."

That is how Mr. Gibson comes to be driving from one to another of his eight big rice farms today, in a $5,000 automobile, to be employing one hundred men and to own something like 6,000 acres of rich, arable land in Arkansas, 2,500 acres in Nebraska, 2,000 in Illinois, 1,000 in Colorado and a few miscellaneous hundred scattered elsewhere. In three years' time he has found that there is considerable to this "farming game" and this "back to the land craze" after all.

In the beginning, he was not the owner of his present Arkansas acres. It is doubtful if he would ever have known much about the state if it had not been that his father missed a train up in Illinois one day. It was provoking, but there was nothing for it but a wait of several hours in a little way station. It was at this juncture that Fate sent along a man who had just returned from Arkansas, brimful of the possibilities of Arkansas land.

When Fred Gibson read the letter which his father wrote him that night, after talking to the Arkansas traveler, he was out in Colorado, looking over a mining offer which seemed to promise well. He re-read the letter and then expressed himself in forcible language: "What do I know or care about Arkansas?"

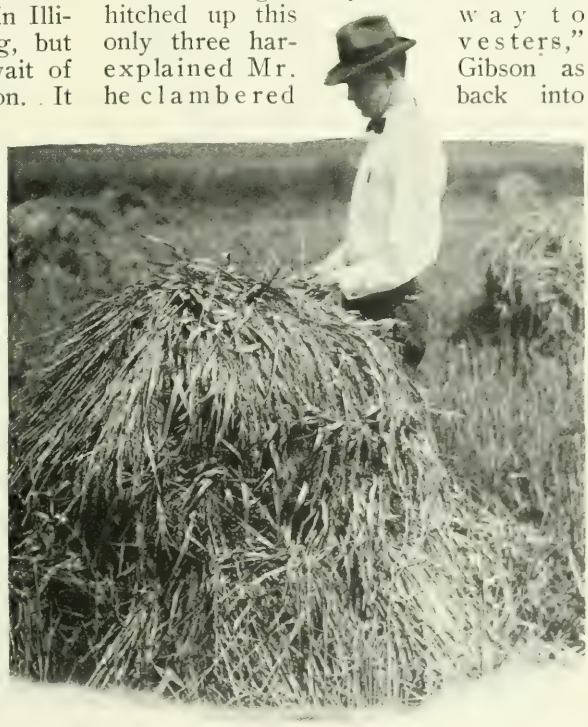
But unattractive as Arkansas appeared at first glance, it was winter in Colorado and there were blizzards, while down South it was warm, and anyway there was always Hot Springs if the rest of the state palled.

When Fred Gibson took the train out of Stuttgart a week later, homeward bound, he bore with him deeds to a thousand acres of Arkansas farm land. And he was merely going back to Colorado and Illinois, so as to pack up and make Arkansas his permanent home.

The next thing Mr. Gibson did stamps him as out of the ordinary. He returned to Arkansas, with his Lares and Penates, and buckled down to a year's hard study of the "farming game," as played in Arkansas. Now, three years in the state university had familiarized him with the pastime of study, but the new brand of study was the genuine article. It was simply one farm textbook after another; books on stock raising, on corn and alfalfa and potato and wheat and oats and what-not growing, on the care and treatment of various soils, on almost everything that a farmer ought to know. The only relaxation were the farm papers, with their various departments edited by experts and their column after column of farmology, ready for the practicing.

After that, he was ready to get his experience first hand, in big chunks.

"I'm losing money on this tractor, hitched up this way to only three harvesters," explained Mr. Gibson as he clambered back into



He Farms "by the Book" and Makes It Pay, Too.

PANNED OUT
SIXTY-FIVE BUSHELS TO THE ACRE.

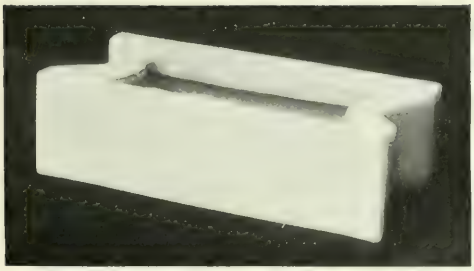
the automobile, after having helped the foreman fix an obstreperous connection between the "caterpillar" and one of the trailing cutting machines. "A mule costs me eight cents an hour, figuring six per cent on his original value, together with feed and wear and tear. So long as the 'caterpillar' hauls only three harvesters it does the work of but twelve mules, which means that it is worth, in mule power, ninety-six cents an hour, or $9.60 for a ten-hour day. It burns fifty gallons of gasoline a day and gasoline is at seventeen cents now, so altogether, with interest on the original value and wear and tear, the tractor costs me about $12.50 a day. At this rate I'm losing $3.00 every day on the big machine, but it gives me my mules for other tasks and so I break about even and keep mules and machine both busy. Now you take that tractor we passed over there, disking and seeding for oats. I figured it out last night and that machine is doing the work of forty mules, six discs, two 20-hole drills, two harrows and ten men, at a cost of only $1.35 an hour or $13.50 for a ten-hour day. That's saving money for me and keeping every hand and cog on the place busy. That's where the profits come from and that's why it pays me to sit up nights figuring things over and to hire a force of clerks for the office who can tell me, at a minute's notice, what every man and machine and mule is worth per hour."

It was later, over the records of each farm, in the central office at Stuttgart, that we got the exact figures, farm after farm, day after day, crop after crop. For instance, there was the bulky portfolio of "Daily Time Records," one for each of the 100 workmen, each day of his employment, with blanks for name, date, number of the farm, wages per month and day and hour, description of work each hour of the day from 4 A. M. to 8:30 P. M., kind and number of each implement used and number of each animal used. It is by this system that the cost of mule versus gangplow is obtained, that the net earnings of each of the eight Stuttgart farms are ascertained, year by year. For instance, the first rice farm to harvest and thresh the 1912 crop yielded eighty bushels to the acre, a total of 5,200 bushels for the sixty-five acres. It brought $1 at the mill at Stuttgart. The second field, 112 acres, yielded 65 bushels of another kind, bringing ninety cents, a total of 7,220 bushels valued at $6,498. The two fields yielded a gross income of $11,698. One of the clerks was busy for a short time, compiling a table of cost, from interest on investment to labor, seed, machine depreciation and pump operations, and then the net profits of the farm stood forth: $8,554. The farm cost Mr. Gibson $24,000 two years ago; it had yielded the book farmer 33 1-3 per cent profit the second year it was planted.

TORCH A CYCLOPS MIGHT COPY.

THREE-HUNDRED-FOOT TORCH

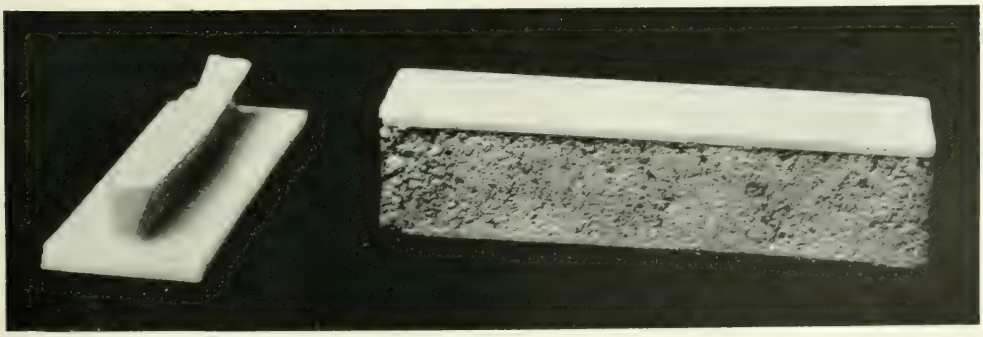
A GUSHER near Bakersfield, California, had just been "brought in" this summer, and was jetting its black wealth high in the air, when a fire was ignited in a nearby engine house. Before it could be checked, the flames had run across the oil-soaked ground, invaded a neighboring sump hole, or storage basin for crude oil, and set it ablaze, and directly afterwards the gusher itself caught fire, affording one of the most spectacular conflagrations ever seen in the oil fields. As the oil was jetting high above the surrounding derricks, it made a torch estimated at three hundred feet high, and of course the smoke was carried even higher. For several days and nights the fire went unquenched, as there was great difficulty experienced in subduing it by means of the clouds of steam which are employed to smother oil fires. By night, the spectacle was especially magnificent, as the great fountain of flame would rise and sink, sometimes almost disappearing and then suddenly spouting high. After burning more than a week it was finally subjugated, but the financial loss was enormous. The flow was estimated at about 7,000 barrels a day, all of which was destroyed, and this together with the loss of stored oil, buildings, derricks, etc., approximated $33,000.



DOUBLE-FACED GLASS BRICK TO BE FILLED WITH CONCRETE.

NEW GLASS BUILDING BRICK

GLASS-FACED bricks with concrete backing have appeared. They seem to be superior to any form of tile or glazed brick as a lining for tunnels,



SINGLE-FACED GLASS-AND-CONCRETE BRICK

THIS NEW FARMAN BIPLANE IS BUILT FOR SPEED.
Note the extraordinary seat for pilot in front.
It is shown detached.

swimming pools, or bath rooms; for the inside walls of garages, engine houses, prisons, meat markets, and other structures where perfect cleanliness is as desirable as difficult. They are heat and cold resisting, and declared to be everlasting, requiring no paint or other treatment to preserve their appearance. For shops and factories the concrete-backed glass-brick would seem an almost ideal material.

The construction of the brick is as follows: To a glass facing one-fourth inch thick at its thinnest part is attached a well-proportioned concrete back. The concrete backing is attached to the glass front by three separate means, each entirely sufficient to secure the union of the two materials. First, the cement on the concrete adheres to the glass; second, both ends of the glass face are returned by greater than a right angle, thus imprisoning the concrete mass; third, a dovetailed rib of glass traverses the entire length of the back of the facing, at

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IN MEMORY OF DR. JOSEPH RIZOL.
This statue of the Filipino patriot, executed by the Spaniards in 1896, is carved in granite by Richard Kissluy of Zurich, Switzerland. It will be placed in Manila.

once strengthening the glass face and also securing it to the concrete body. The glass face is 1.16 of an inch larger all around than the concrete body, thus making possible a good mortar bond, notwithstanding that the mortar between the faces of the glass may be almost entirely pressed out.

The new brick are laid in exactly the same manner as are any other finished brick.

THE NEW BIPLANE OF THE FRENCH AVIATOR, HENRY FARMAN, IS OF UNUSUAL DESIGN.
The seat for pilot is shown in more detail above.

NEW PLANES FOR AERIAL NAVY

NEW specifications have been drawn by the War Department for the scout military aeroplanes to be purchased with the first expenditures of the $100,000 appropriation made by the last Congress.

To effect easy shipment by rail or boat the maximum spread of the supporting surfaces is fixed at forty feet. The engine for the two-passenger machine must be of American make. A maximum speed of sixty-five miles an hour is fixed for the larger machine. These are new features of the specifications.

It is required that the one-passenger machine climb 1,500 feet in three minutes carrying fuel for a one-hour flight. The two-passenger machine must rise 2,000 feet in ten minutes carrying 600 pounds of weight, including the aviator, passenger, 150 pounds of oil, and other weight. Both machines must be capable of making a figure eight within a rectangle 500 yards by 250 yards, although it is not required that extra weight be carried during these tests.

The one-passenger machine must attain a speed of 65 miles an hour. The two-passenger aeroplane must make 40 miles an hour but not more than 65 miles an hour is demanded.

Engines must be capable of being throttled at reduced speeds, both machines must land and rise on plowed ground, carrying full weight, and the supporting surfaces must be large enough to satisfy the army officers that a safe gliding angle will be insured. A two hours' continuous endurance test for engines is provided. Brig. Gen. James Allen, chief signal officer of the United States army, is uncertain how many machines will be purchased under these specifications.

SEWER ACROSS A RAVINE AS SEEN FROM THE SIDE.

THE SEWER FROM IN FRONT.

FINEST CANDELABRA IN THE WORLD.

It is ten feet high, carved from Carrara marble. It was ordered by August Belmont, together with three altars of similar type to be placed in the Belmont Chapel of the Cathedral of St. John the Divine, New York City.

BEAUTIFYING A SEWER

THE accompanying photographs illustrate the method adopted in carrying a 66-inch sewer pipe across a ravine in Washington Park, Seattle, Washington.

The structure is built of reinforced concrete, with brick facing, the design being copied from an old Roman aqueduct. The general appearance of the structure is in keeping with the park surroundings and makes a very pleasing appearance. There is a 5½-foot walk across the bridge. This bridge is wired for lights. The structure cost $15,000 to erect. It is a part of a sewer system now nearing completion in Seattle.

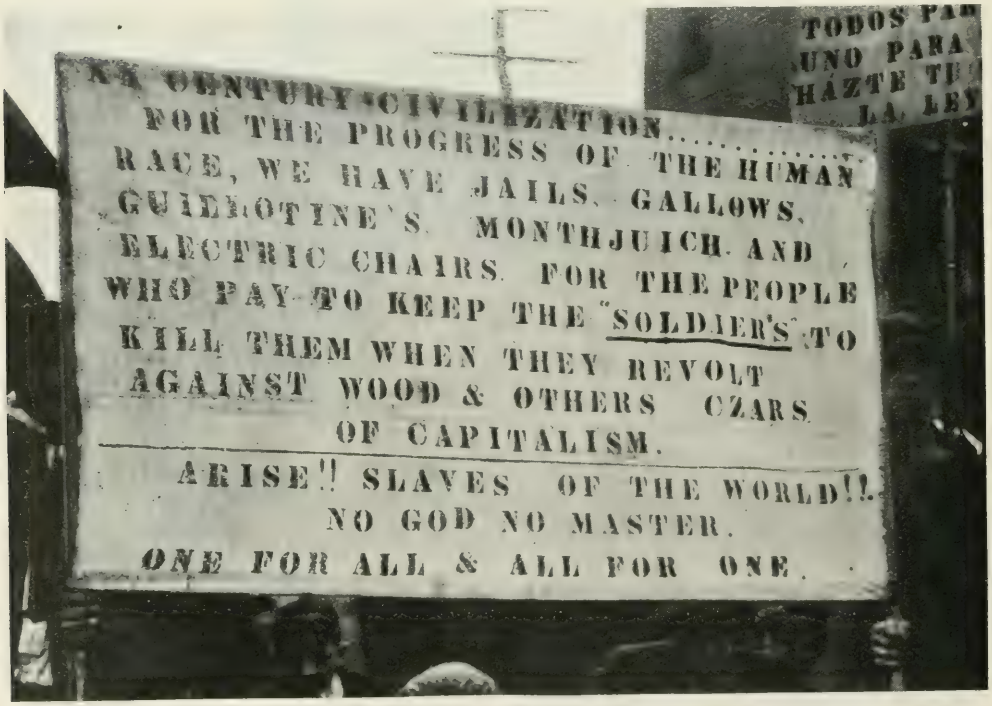
Fence Taken Prisoner by Row of Poplar Trees.

Line of Police that Drew Itself up in Front of Parade at Lawrence and Put a Stop to Proceedings.

FENCE CAPTURED BY TREES

MANY years ago a gentleman in New York utilized a row of poplar trees in making a fence by nailing boards to them. In the course of time the trunks of the trees, in growing, overlapped the boards, until, at the present time, the boards are near the middle of the trunks. Not needing the fence any longer, the owner sawed off the boards. The remnants of these boards can be plainly seen protruding from the trunks of the trees in the near foreground.

It is a rather unusual thing for nature thus to set about amalgamating into a plant the dead product of another. Of course the thing can't be done, but the process is, nevertheless, interesting.


TODOS
UNO PARA
HÁZTE
LA LEY
FOR THE PROGRESS OF THE HUMAN
RACE, WE HAVE JAILS, GALLOWS,
GUILLOTINES, MONTHJUICH AND
ELECTRIC CHAIRS FOR THE PEOPLE
WHO PAY TO KEEP THE "SOLDIERS" TO
KILL THEM WHEN THEY REVOLT
AGAINST WOOD & OTHERS CZARS
OF CAPITALISM.
ARISE!! SLAVES OF THE WORLD!!
NO GOD NO MASTER.
ONE FOR ALL & ALL FOR ONE.

THE "BANNER OF REVOLT" AS DISPLAYED BY A PARADE OF MILL WORKERS AT THAT CENTER OF SEETHING LABOR UNREST, LAWRENCE, MASS.

DR. RALPH H. SPANGLER,
He is treating epilepsy with
rattlesnake venom.

RATTLESNAKE VENOM MAY CURE EPILEPSY

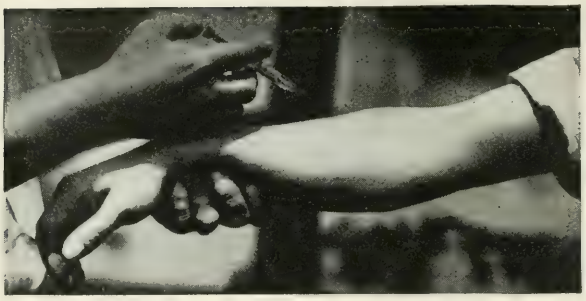
By

A. ST. GEO. JOYCE

DOWN in the Texas Panhandle, five years ago, a man was bitten by a rattlesnake. The man was an epileptic. He recovered from the poison of the snake-bite. Two years passed and during all that time there was no recurrence of the epilepsy. Before the chance meeting with *crotalus horridus* on the Texas prairie he suffered from epileptic spasms every two or three days. The strange coincidence between the bite of the rattlesnake and the cure of the epilepsy was brought to the attention of a Texas physician, who made a statement of the case, which finally reached the attention of Dr. Thomas J. Mays and Dr. Ralph H. Spangler of Philadelphia. Dr. Spangler, chief of the Medical Clinic of the Methodist Episcopal Hospital of Philadelphia, had been experimenting with rattlesnake venom in the treatment of other diseases.

Dr. Spangler had several cases of epilepsy under his care and, with the Texas instance in mind, he determined to try the effects of hypodermic injections of a solution of the dried venom of the rattlesnake. The reaction varied with each individual, but in each case there was the characteristic swelling, discoloration of the arm—where the venom was injected—and more or less severe pain. By the third or fourth day the symptoms disappeared and at the end of a week a second injection was made, at some distance from the first. Gradually, as with repeated treatments the local symptoms became less marked, the strength of the dose was increased.

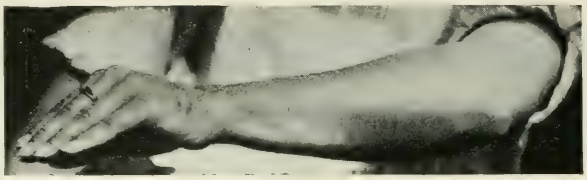
The effect on the epilepsy was marked.



INJECTING THE VENOM.

the sharp edge of a small china cup or with a spoon. The pressure of the fangs on the end of the surface forces the poison fluid from the sacs and the "milked" snake is put back in his cage wild with rage. It is necessary to handle approximately a score of the reptiles in this manner before a sufficient quantity of the poison can be obtained for experimental purposes.

Almost from the start the number of attacks decreased. The treatment continued and at the end of a year all of the patients were apparently cured or, at the worst, greatly benefited. Dr. Spangler has so far treated 110 patients and has administered about 2,000 injections of the venom. Institutions for the administration of the "venom treatment" are to be opened both in Germany and Philadelphia.



THE ARM IS SWELLING FROM THE POISON.

The venom which Dr. Spangler uses comes from Texas. The "milking" of the rattler to get its poison requires considerable nerve and a steady hand to hold the squirming monster and enrage it in order to make it give up its poison.

The snakes are usually selected when torpid from recent feeding, and are handled by first lassoing them at the back of the head with a leather thong attached to a long stick. As long as the thong is drawn taut around the rattler's neck it is impossible for him to withdraw his head and he is powerless to strike.

While one man holds the thonged stick another pries open the snake's mouth with

EXTRACTING VENOM FROM A LIVING "RATTLER."

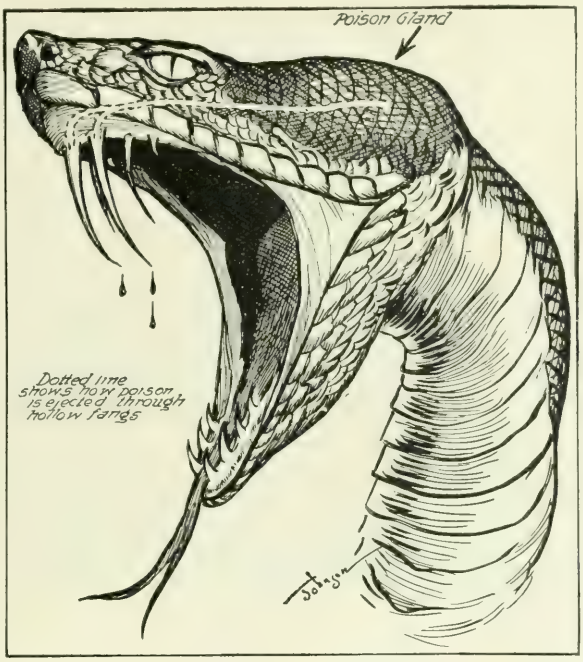
Dr. Spangler found that following the injections of venom the number of attacks was lessened. Patients which previously had been subject to "fits" every week were not attacked, during the venom treatments, for two and three months. The injections continued and in the course of about a year none of the patients under the treatment had had a single attack.

Dr. Spangler found that the venom injections had the effect of lengthening the period of coagulation of the blood. This, physicians considered a remarkable discovery, since it had been previously determined that rapid coagulation was the real cause of the epileptic attacks in sufferers. The quick coagulation, or blood-clotting, was the cause of the "fits."

In eighteen patients Dr. Spangler, with the venom treatment, had increased the time of coagulation from 2½

to 3 minutes to between 5 and 6 minutes during six months' treatment with the rattler venom. The normal period of coagulation of the blood is about 7 minutes.

Dr. Spangler believes that his venom treatment of epileptics will ultimately be used by the medical fraternity everywhere. If so, it will prove a big boon to mankind. He was the first physician in this country to use the venom in connection with epilepsy and so confident is the medical world that the disease has at last been conquered, that arrangements are now under way for the building of a sanitarium to further Dr. Spangler's experiments. There has just been opened at Cassel, Germany, such a sanitarium, at which the "rattler" venom method of treating epilepsy is being extended. Dr. Fackenheim, a noted European specialist, is directing the work of the institution there.



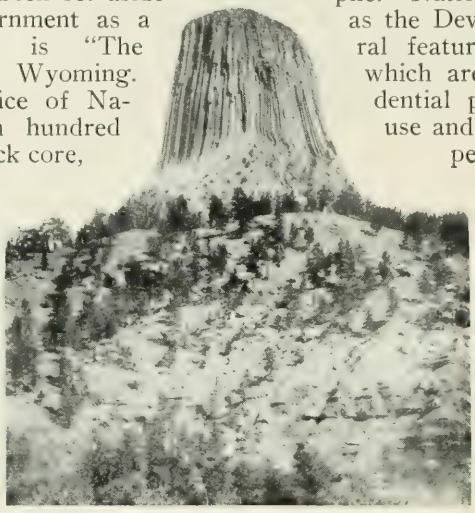
THE HEAD OF A RATTLER.

In every case which Dr. Spangler has treated with the venom there have resulted not only permanent cures and a decrease in the number of epileptic attacks, but there has always followed a general building up of the physical and mental condition of the epileptic. He recently exhibited to the writer eight cases which were under his observation. Through the use of the snake venom the epileptic attacks of the sufferers have either been permanently cured or have not occurred for periods of from four months to three years.

One was the case of an eleven year old school girl who had been taking the venom injections at weekly intervals for seven months. The first week she had a series of three modified attacks in twenty-four hours. At the time I saw her she had had only three minor attacks in seven months. She now attends school regularly and is physically well.

THE DEVIL'S TOWER

ONE of the natural wonders of the West which has been set aside by the Federal government as a National monument is "The Devil's Tower" of Wyoming. This remarkable edifice of Nature, which is seven hundred feet high, is a great rock core, protruding from the top of a sandstone hill, itself 300 feet high. At the base of the hill flows the Belle Fourche, which carries fertility to the rich but dry lands of this part of the West. Strange as it may appear the Devil's Tower is not impossible of ascent. The tops of the broken columns or ribs serve as footholds for the adventurous rock climber, so that quite a number of people, one woman among them, have viewed the surrounding country from the top of this singular pile. National monuments, such as the Devil's Tower, are natural features of great interest which are set aside by Presidential proclamation, for the use and enjoyment of all the people of the United States.



THIS STRANGE PIECE OF NATURE'S HANDIWORK IS CALLED "THE DEVIL'S TOWER."

DUMPING SLAG BY NIGHT

ONE of the spectacular sights of a great Montana copper smelter is the dumping of the slag, or molten refuse, after the copper has been drawn off. While still liquid and white hot, it is tipped out down hill like lava from a volcano.

REMARKABLE SPECTACLE AT A MONTANA SMELTER—DUMPING SLAG BY NIGHT.

WHERE A TWENTIETH CENTURY APARTMENT HOUSE ELBOWS ONE OF THE FIFTEENTH.

FRENCH "FLATS"

LIKE an exhibit to illustrate the development of apartment houses is this view of mediaeval and modern Parisian tenements. The time-scarred, dingy building with the portal and the many individual chimney pots survives across the street from one of the newest Parisian types of apartment house — one almost as modern as anything along New York's Riverside Drive.

Almost as modern, but not quite. The French are accredited with being the pioneers in the modern apartment field, but have not developed their idea as rapidly in recent years as Americans have. The French have been slow to make the most of elevators and of a few of the advantages to be conferred by the plumber. Running hot water, for example, is rarely expected. The Parisians, however, have built substantially and beautifully and have indulged in fewer architectural deformities than American apartment house builders.

The accompanying photograph is, incidently, characteristic of what is going on all over ancient Paris; a transformation much lamented by lovers of the old and the quaint, but a source of great pride to commercial progressives. All over the older section of the city there are just such startling contrasts—the Twentieth Century elbowing out the Fifteenth, or a modern boulevard cutting a great swath through a district where before the traffic wriggled through narrow lanes.

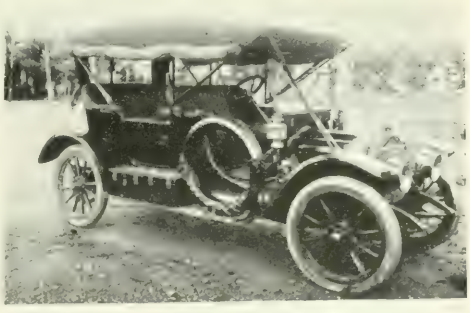
AUTO TOURING TENT

A VERY practical form of tent for touring cars has been devised at Little Rock, Arkansas. The photographs, practically self-explanatory, show the tents ready for use and ready for travel, and were constructed by the designers for their personal requirements on a Western tour. Finding them so thoroughly satisfactory in every way they had the idea patented.

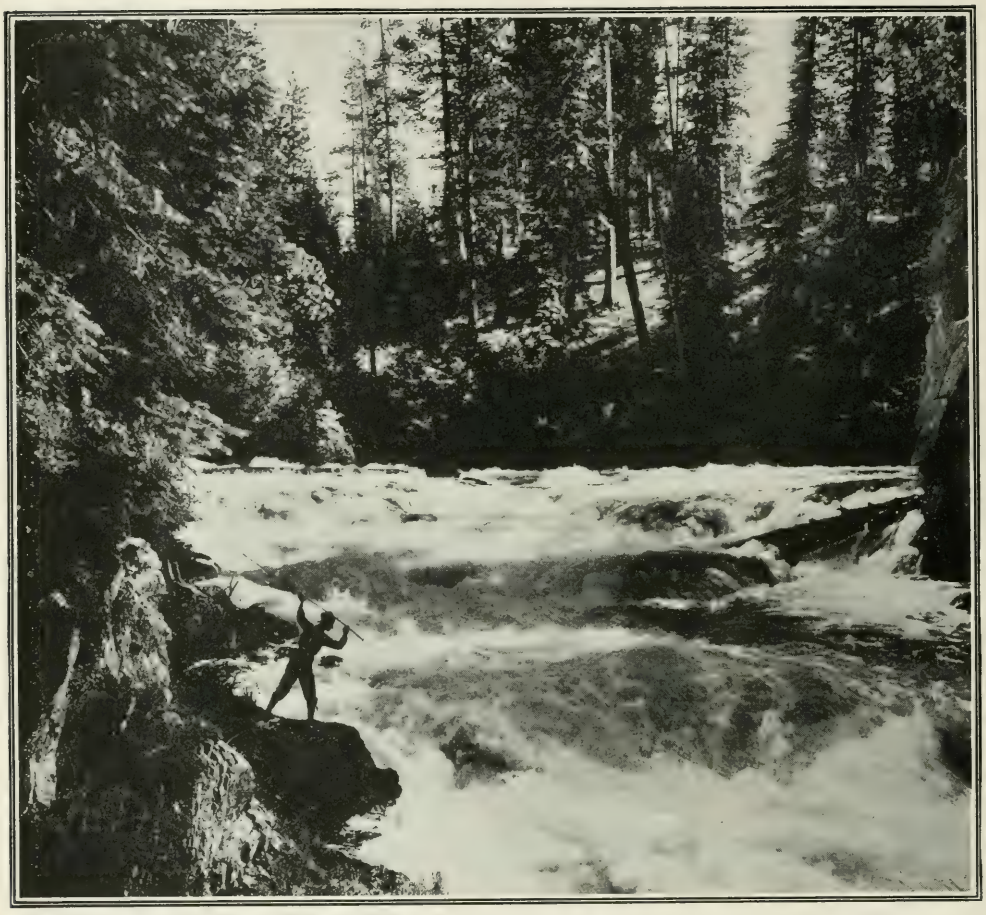
The tent fastens to the side curtain studs of the auto top and may either be carried rolled up on the top, like curtains, or separately on one of the running boards. Used in connection with the double deck cots, the tents accommodate four people, and the auto can be used as a dressing room. The tents extend from the sides of the car and form an integral part of it.

The tents are made of khaki tent cloth and weigh seven pounds each, both cots and tents together weighing about forty pounds. One photograph shows the car from the front with tents attached to each side; the other car may be seen with the tents rolled up out of the way.

AUTO TENT READY FOR USE.



AUTO TENT AS ORDINARILY CARRIED ON CAR.



IN MIDDLE GORGE OF BENHAM FALLS, DESCHUTES RIVER.

THE FREAKISH DESCHUTES RIVER

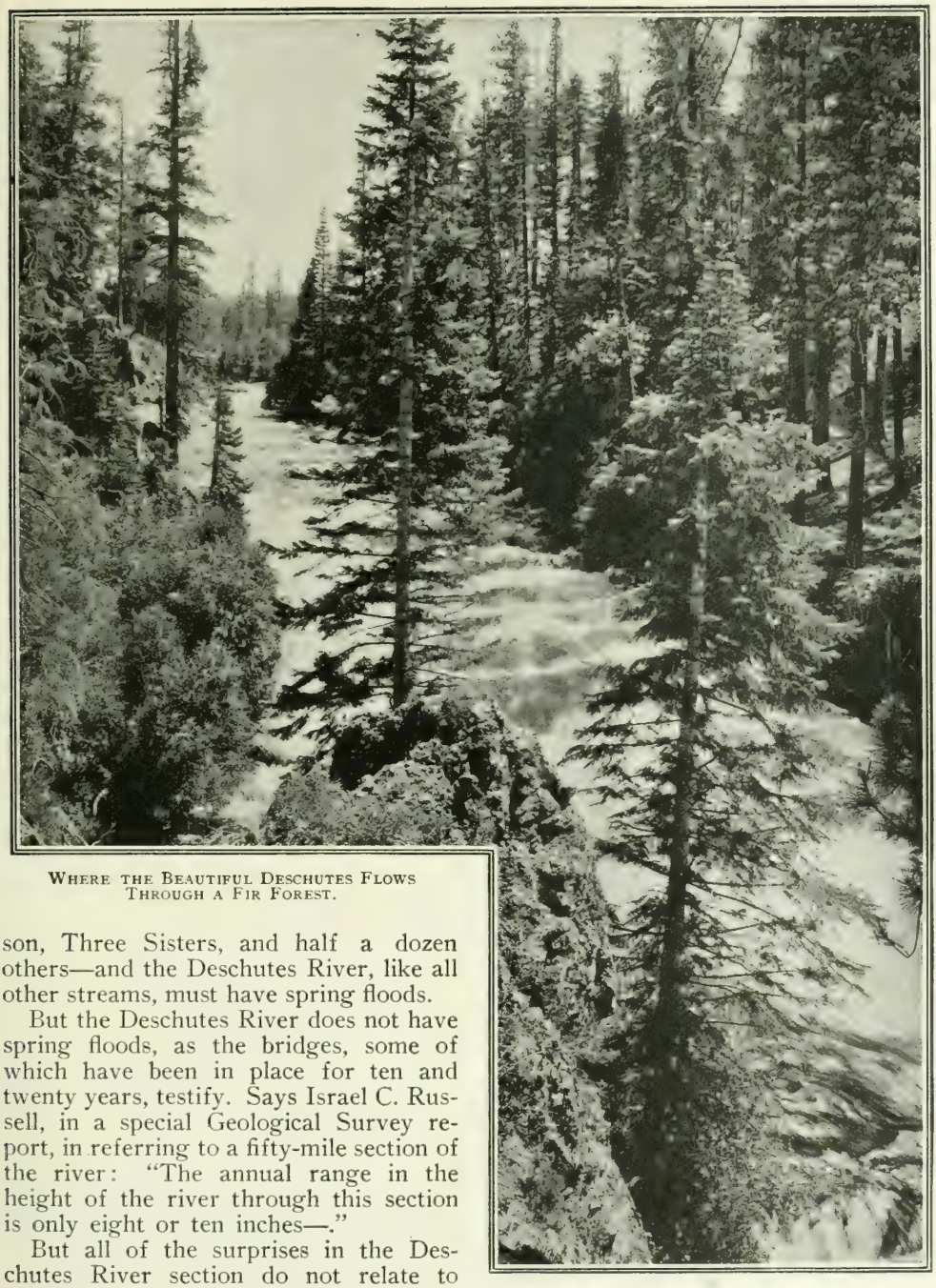
By

RANDALL R. HOWARD

THE average observant traveler is interested and surprised when he sees the upper Deschutes River in Central Oregon for the first time.

The stream borders a desert plain, and has steep volcanic-formed banks, and there are roaring waterfalls—but these particular features are not uncommon in the West. The surprise is in the bridges. The bridges are peculiar because they seem almost to float. A barefoot boy could sit in the middle of many of them in mid-summer and dangle his toes in the swiftly-flowing water.

At first thought, the practical-minded man would be inclined to tag the bridge builders with a "fool" epithet—for the Deschutes River drains nearly three hundred miles of the eastern slope of the rugged Cascade Range, with its perpetually snow-capped Mount Hood, Jeffer-



WHERE THE BEAUTIFUL DESCHUTES FLOWS THROUGH A FIR FOREST.

son, Three Sisters, and half a dozen others—and the Deschutes River, like all other streams, must have spring floods.

But the Deschutes River does not have spring floods, as the bridges, some of which have been in place for ten and twenty years, testify. Says Israel C. Russell, in a special Geological Survey report, in referring to a fifty-mile section of the river: "The annual range in the height of the river through this section is only eight or ten inches—."

But all of the surprises in the Deschutes River section do not relate to bridges. For instance, there are certain people of the section who will not enter a well or a cave. Their fears and superstitions date back to the story of the man, for example, who was digging a well—when the bottom dropped out. His hat was swished away into black space, and his tools went clanging into the weird unknown.

Other men can take you to spots out in the arid Deschutes River Valley where water can be heard rushing far below, or where the wind is whistling up from some unknown region. There are vol-

canic craters by the score, some of them surrounded by the most recent lava flows in the Northwest, and some of them almost covered up and weathered away. There are also miles of volcanic caves, and other spots where the road crosses caverns for which no openings have been found.

Some of these caves have been made useful, even commercialized. There is, for instance, Horse Cave, which a few years ago before the days of the irrigation farmers, was the center of a network of stock trails leading miles into the desert. Horse Cave was a popular resort, the coolest place in the summer and the warmest place in the winter, and there was room for scores of four-footed animals.

Other cave openings were used by stockmen for night corrals in their long drives across the desert—especially since water or ice could often be found there until late in the summer. Certain of these cave openings are still favorite camping spots for travelers along the road. Another special one of the caverns, Ice Cave, came into prominence when it was homesteaded by a man as the result of an attempt on the part of a Bend saloon-keeper to corner the available ice supply of the community during a hot summer month. A rival joint-keeper found and developed Ice Cave, and he clinched the find by filing on it as a homestead. Then he regularly hauled four-horse loads of the inexhaustible ice supply, which mystically "grew back" as fast as it was sawed out.

There is an intimate connection between these volcanic caves and the Deschutes River, as may be guessed. Early travelers tell of the time when the water of the river at one point was too warm to drink. Hydraulic engineers point out one spot where the water flow of the stream diminishes from 1,700 cubic feet to 1,400 cubic feet within a few miles. At certain points large volumes of water can be seen disappearing into lava cracks. Likewise, great springs may be seen. One of the largest branches of the Deschutes River, Spring River, is only a mile long, but the bottom is literally a living mass of bubbling water and sand.

Geologists point to the Deschutes River as a most remarkable example of the life struggle of a river against lava. The time was when the upper valley of the Deschutes was thirty miles wide at places, and not less than eight hundred feet deep. Then came a great lava flow filling the valley to a depth of seven hundred feet. The river began to regain its channel, when another flow of about eighty feet of hard basaltic lava came. Again the river wore down its channel to a depth of eight hundred feet in places. But there was still no peace, and the most recent basaltic lava flow has filled the old channel to a depth of about five hundred feet.

The remarkably uniform flow of the Deschutes River, its freakishness, is due to the old underground channels that have been retained or worn through—added to the natural sponge-like porousity of new lava soil. The lower Deschutes River has again worn out a deep canyon. This canyon, it may be remembered, was the recent scene of the dramatic railroad war between the Hill and the Harriman railway interests, both interests seeking by strategy and the outpouring of money to gain first rights for their projected rival roads into the then largest railroadless area in the United States. The railroad fight was declared a draw, and the two rival railroad tracks now parallel each other for nearly a hundred miles, down in the wild tortuous canyon where roars the freakish Deschutes River.

ICE IN THE TROPICS

NATURAL ice beneath a bearing orange tree is the remarkable sight which during a recent cool spell attracted the attention of the residents of Pomona, California.

Through a wonderful coincidence of two very unusual events, a few residents of Pomona were privileged to witness just such a spectacle. An orange rancher of the place in cranking an old model two-cycle car was unaware that his engine had back-fired, causing the motor to turn just opposite to the customary direction. Speeding up the motor and throwing in the gears, he had backed through a wire fence, a rose-bush and a fig-tree before rupturing the water-hydrant, and being brought to a stop by the sturdy orange tree behind it.

All that night the injured faucet continued to send up a finely atomized spray of water. Contemporaneous with this there happened a second wonder in the orange-belt; frost visited the region of semi-tropic climate that night. When the sun rose out of the arid desert to the east on the next morning, he showed a veritable miracle, for in his absence, the minute particles of water had one by one congealed on the rank undergrowth and low-lying pepper-tree boughs, until they were formed into cold bluish monuments of solid ice. Such a spectacle of vegetable ice, beneath tropical vegetation probably has never before occurred in California, and could not have occurred elsewhere. Then the perfervid tropic sun beheld the sight, and, lo the thing was no more.

NATURE'S PARADOX—ICE IN THE TROPICS.

A LINE OF OUR BATTLESHIPS AS THEY APPEARED RECENTLY AT NIGHT OFF NEW YORK CITY.
Some of the vessels—from left to right—shown are the *Delaware*, *Michigan*, *South Carolina*, *Louisiana*, *Kansas*, *Vermont*.

NEW DIVING APPARATUS THAT ANYONE CAN USE.

WASPS ARE PROVING THEMSELVES A GREAT NUISANCE IN ENGLAND.

The Schools are offering prizes for wasps in an effort to exterminate the pests. The boy in the picture has just brought in a string of 60 queens.

DIVING FOR EVERYBODY

A NEW diving apparatus has been invented by a Frenchman, M. Maurice Fernes, for years a seafarer. The apparatus is very simple. It consists of a pipe, the side opening of which is fastened airtight, to the mouth of the operator while an exhaling opening supplies fresh air by means of an ordinary automobile pump. The whole apparatus weighs fourteen pounds and will enable anyone to dive and stay under water for a considerable period of time.

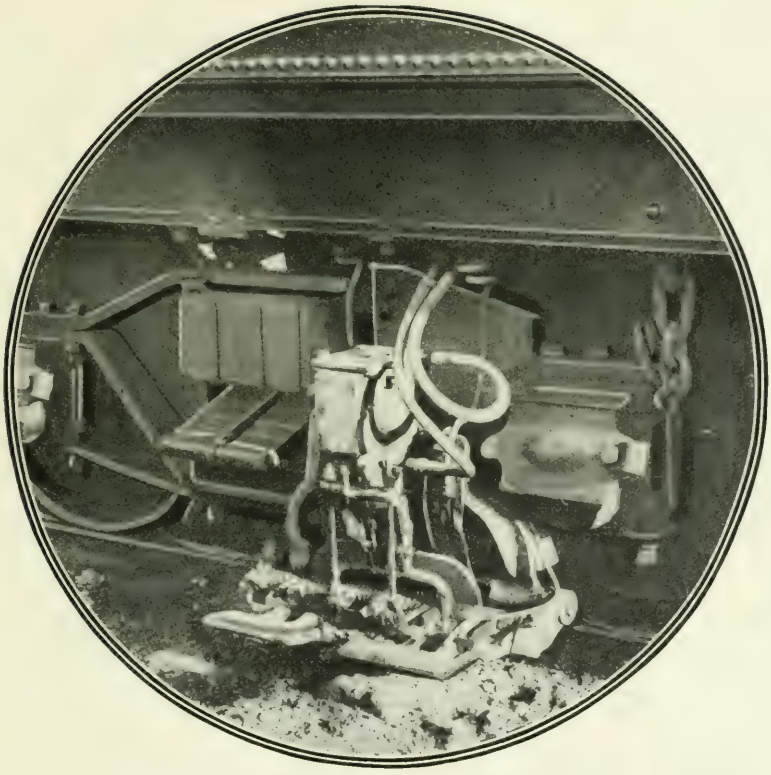
During the experiments in the Seine M. Fernez remained beneath the water twice for ten minutes, and walked on the bed of the river from one Seine bridge to another.

IT'S TRULY A "PLAYHOUSE"

AMONG "playhouses" an institution in Abilene, Kansas, is unique by being literally what it calls itself. Not a theater, for it isn't that at all—simply a house to play in! That is to say, the "playhouse" furnishes a place for barn dancing, roller skating, basket ball and the like, and any sort of "society event" that requires the amount of floor space afforded by what was once a grain elevator.

Abilene had this playhouse a good many years ago and, of course, only regrets that the institution was not owned by the citizens, for in that event the town might whimsically claim to have had "the first municipal playhouse."

THE LINE "PLAY HOUSE" ON THIS BUILDING DOESN'T MEAN "THEATER."



THE THIRD-RAIL CONTACT SHOE IN THE NEW RAILWAY SAFETY DEVICE.

TO PREVENT TRAIN WRECKS

By

ROBERT H. MOULTON

HOW to prevent railroad wrecks, such as repeatedly shock the nation, is the problem that has long puzzled railroad men. So long as the safety of speeding trains is left dependent upon the watchfulness of one man, there will be accidents: for no human being is infallible.

A young New York inventor, Frederick Lacroix, has been seeking the solution of this problem for ten years. He has evolved a mechanical device for stopping trains that has proved successful under the most trying conditions, and he has the Interstate Commerce Commission and the Public Service Commission to back him up.

According to Mr. Lacroix, the statement of the officials of one line on which many lives were lost that, every up-to-date safety device for the protection of passengers is in use on their road is incorrect. He even goes further and maintains that the railroads of this country have refused, and will probably continue to refuse, to install proper safety devices on their roads until they are compelled to do so by the overwhelming force of public opinion.

A Third-Rail, One Hundred Feet in Length, is Set in Every Mile of Track.

railroad accidents which are of the "rear-end" sort, by stopping the oncoming train before it could collide with the stalled train ahead. Everyone who travels is familiar with the signals at present employed — those arm-like things that go up and down to notify the engineer if the track ahead of him is clear.

In general, the things upon which Mr. Lacroix takes issue with the railroad officials resolve themselves into a question as to whether it is better to depend upon the individual locomotive engineer or upon an automatic device. The block signal system at present employed is automatic as regards the signals being displayed, but everything depends upon the engineer's seeing the signals.

It has been asserted by the traffic manager of one road that anyone who has ever sat in the cab of an engine knows that there never is a fog thick enough to hide signals from the engineer; that he can almost touch them from his window. In answer to this Mr. Lacroix declares that many engineers have failed to see signals, that very often in fogs the engineer cannot see the length of his own engine, and that sometimes the signal is displayed over fifty feet away.

Also, it is not enough that the engineer should see the signal—he must see it in time to avert an accident. Therefore, when the railroad officials say that every precaution is useless when one man fails, and add that nothing can be done, because nothing can be invented to take the responsibility off the shoulders of the man in the engine, and that nothing can take the place of the human brain in the cab, Mr. Lacroix begs to differ with them.

Mr. Lacroix claims the device that he has patented would, for instance, prevent

But with this method there are three ways in which accidents can and do occur. The first is that the signals—called "block signals"—may not work properly; second, the engineer may fail to see the signals; and third, he may be stricken dead at his post by, say, heart failure, leaving the train to plunge along by itself.

The Lacroix invention will serve to prevent collisions in each of these three instances. It is entirely independent of the engineer, and will work as efficiently whether he is alive or dead, whether he does or does not see the signal, and whether the block signals work perfectly or not. Its effect will be, in case the engineer runs past the signal that he is supposed to heed, to bring the train to a dead stop on the instant.

Mr. Lacroix's apparatus is extremely simple and requires but little expense to maintain. The system, to explain it as baldly and concisely as possible, comprises a railroad cab signal and automatic train stop of the intermittent contact-rail type, in which an electric current, generated on the locomotive, normally holds closed an electromagnetic air brake and at the same time lights an incandescent lamp in the cab. As long as the block ahead is clear the lamp will continue to burn. But any obstruction immediately produces a short circuit, not only putting out the lamp, and thereby giving the engineer warning, but also applying the brakes automatically.

FATHER JOSÉ ALGUÉ.
Director of the Philippine Weather Bureau, who has invented a device to foretell the approach of typhoons.

TO LESSEN THE TERRORS OF THE TYPHOON

By

ROBERT G. SKERRETT

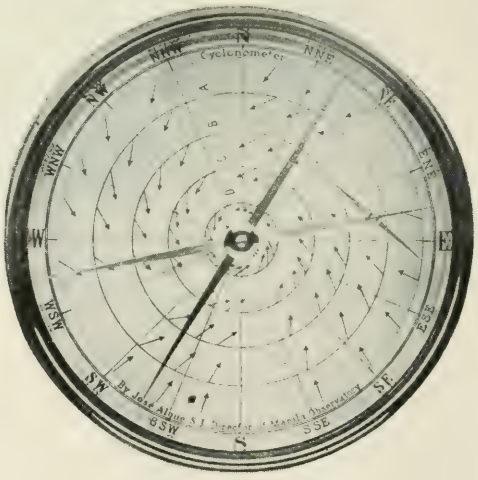
NOTHING that man can do is able to lessen the awful destructive force of the typhoons which ravage the far East or of the cyclones, which are almost as greatly dreaded in the Western hemisphere. But it would be a great thing to be able to foretell the coming of one of these resistless storms and to locate the center of the convulsion and the path of its progress.

Exactly that has been accomplished by the remarkable invention of Father José Algué, the present director of the Philippine Weather Service, with headquarters at the observatory in Manila. Though the work of the good father is of the highest scientific value, he has been actuated chiefly by a desire to afford some protection to the unhappy people of the islands, hundreds of whom lose their lives—to say nothing of millions in property—every time one of these sudden and unpredicted storms breaks upon them. The name of Father Algué's invention is the barocyclonometer.

Don't let the name dismay you. The barocyclonometer is, in brief, a double meteorological instrument: the barometer registering the pressure of the atmosphere and the cyclonometer constituting a wind disc or chart of the swirling air currents of a tropical tempest. With these two apparatus in combination, Father Algué has made it possible first, to give ample warning of a distant cyclone, and second, to enable the observer to locate the dreaded center of that storm and to trace its movement and probable continuing course. In the Far East, the barocyclonometer constitutes an important part of the navigational equipment of more than a thousand vessels; it is widely used on shore, and the net result of its presence has been the safeguarding of thousands of lives and the securing against loss of millions of dollars' worth of property. The typhoon of the Orient has its counterpart in the cyclonic storms of the West Indies, and it is our Government's intention to put one of these instruments on every one of our cruising warships in this hemisphere. In order that this might be done properly, Father Algué has visited the United States and carefully studied the atmospheric records of the North Atlantic and the Carribean Sea, and has gone on to England where these beautiful mechanisms are to be fabricated under his personal supervision.

THE BAROCYCLONOMETER COMPLETE.
At the left is Father Algué's barometer and at the right his Cyclonometer.

Even the veriest tyro in matters meteorological knows or has heard that the center of a cyclone, called its vortex, is the part of the storm most to be feared, because it is there that the waters of the sea are heaped up in the form of mountainous waves while the winds just outside blow with terrifying force and velocity. The further one gets from this direful maelstrom the less is the damaging energy of the wind. At sea the sailorman wants to know how to keep clear of this area of greatest peril, and on shore the people whose homes lie in its probable path also want to know of its coming sufficiently in advance, either to flee, or to seek such shelter as may be of avail against the tempest's fury. Shipping in harbor will either remain there or take to the open sea where it may have a fairer chance to battle with the elements. How has Father Algué made it possible to foretell the coming of the storms and to approximate closely the position of their centers and the paths they are pursuing?



THE WIND DISC OF THE CYCLONOMETER
By this it is possible to locate the storm center and to trace its movements.

To the meteorologist, it is well known

THE OBSERVATORY AT MANILA, THE HEADQUARTERS OF THE PHILIPPINE WEATHER BUREAU.

FLEET OF HARBOR CRAFT THAT HAVE TAKEN REFUGE IN THE PASIG RIVER AT MANILA, TILL THE TYPHOON PASSES.

that there is a definite relation between the atmospheric pressure at the center of a cyclone and that of any outlying point within the area of that aerial disturbance. From the outermost rim of the storm, where the reading of the barometer differs but slightly from the normal for that part of the world at that season, the pressure of the atmosphere diminishes toward the vortex just as the spokes of a wheel move slower through space as you near its hub. Therefore, if the barometer fall below the local seasonal minimum—the degree varying in its significance in different latitudes—the observer can reasonably expect bad weather. If this fall amounts to a determined figure—the result of years of accumulated data—then it is certain that the vortex of the tempest is probably just so far away. Father Algué's apparatus will detect a typhoon when quite five hundred miles distant—this being the radius of a storm covering a total diameter of quite a thousand miles. But while the barometer will do this, it will not give the compass position of the cyclone: the storm may be to the north, to the south, to the east or to the west. It is of the utmost importance that this uncertainty should not prevail, because, in one case, it might lead to unnecessary alarm, and, upon the next occasion, relying upon this, the storm might sweep down with its utmost violence. Did you ever try to locate the source of a sound that reached you through a chimney? You know that your sense of direction was unequal to the task. This is kindred to the directional limitations of the barometer. But just the same, Nature has her own way of taking us into her confidence if we are wise enough to read those signs.

Down in Havana, another priest, Father Benito Viñes, discovered some years ago that high in the sky, days before the arrival of a hurricane, there were long feathery clouds which persisted there and seemed to point to a particular portion of the horizon. They bore no resemblance to ordinary storm clouds, and they hung in the blue of the sunlit sky apparently without any premonitory significance. Just the same, after study and repeated watching, Father Viñes discovered that they were an infallible indication of a distant tempest. The trend of these slim clouds being toward the storm vortex which lay hundreds of miles below the ocean's rim. They were the outermost swirls of the rotating atmosphere which constituted

the storm area. Afterwards, Father Algué and his late superior at Manila, Father Federico Faura, carried the study of the cyclone clouds of the Philippines further by means of a cunning apparatus which both photographed and measured the heights of the clouds. In this way, it was possible for them to prepare a chart of the wind movements of a tropical tempest and to demonstrate how the winds, like curving spokes, converged upon the storm center. Of course, these movements of the atmosphere change more or less according to the prevailing seasonal winds, and their value as an index depended upon a knowledge of what to expect in fair weather at each period of the year. The meteorologist is always guided by prevailing averages, and Father Algué had to find out what these were by studying the records of the Philippine Weather Service for years back. From this data, digested with the utmost care, that worthy priest evolved his wind discs which became the basis of his cyclonometer. In each atmospheric pressure zone of the storm the winds assumed distinctive angles in their general trend toward the vortex.

Without confusing the layman with technicalities, it is enough for him to know that the cyclonometer became a chart upon which the observer could locate himself and also discover the direction of the typhoon's center. The reading of the barometer told him in what zone or region approximating the vortex he was to place himself on the cyclonometer. This showed him how far he was away from the dreaded center. The direction of the prevailing wind confirmed this and pointed to the actual position of that center which he wanted to avoid. By watching the speeding clouds and reading his barometer from time to time, the sailor at sea or the observer ashore could tell whether the storm were approaching or receding. Further than this, Father Algué has made his instrument so that a check can be kept upon the winds over a number of hours, and, by the shifting indicated in that period, to trace the path which the tempest had taken the while. This information is also a guide to the probable course which the storm will follow within a considerable area. Fortunately, Nature's laws are absolute, and there is far more regularity in the movements of the atmosphere, even when disturbed, than most of us begin to realize. It is for this reason, that the averages of past conditions are a reliable index of what may happen in the future.

Father Algué's barometer differs from all other barometers in that it can readily be adapted to give a true reading for various parts of the world. That is, the normal atmospheric pressure for fair weather is different in different latitudes and also dissimilar for other longitudes upon the same parallel north of the equator. In other words, a barometrical reading that would indicate threatening weather in one region would really be the sign of fair weather in another. Father Algué's instrument has a shifting dial, and in this way he can accommodate the apparatus to each locality and then read the warnings of his barometer correctly. Some one may remark that this is so simple that it surely can't be new, but the fact remains that it is both novel and extremely valuable. Father Faura made his barometer to suit only the Philippines: Father Algué has made his instrument to meet the requirements of the principal ocean routes of commerce.

Hereafter, for the navigator threading his way over the waters of both hemispheres, the barocyclonometer will have two dials which will be changed as the mariner passes from the Atlantic storm zone into the typhoon-breeding areas of the Pacific, and vice versa. From a simple cautionary apparatus intended to safeguard life and property in the Philippines, Father Faura's barometer has developed into Father Algué's barocyclonometer of greater usefulness and far wider application. In both cases, however, the inspiration has been a desire to save life and, by proper foresight and action, to lessen the fearful ravages of the dreaded tempest. In the pursuit of this work, Father Algué has become the recognized foremost meteorologist of the Orient and, at the same time, one of the leading scientists of the age. He is really as modest as he is great, and, wonderful as his inventions are, he looks upon them as matters of course and the natural product of his specialism.

THE TRACK ON WHICH THE COAL IS CONVEYED FROM THE PIT.

ODD WAY TO MINE COAL

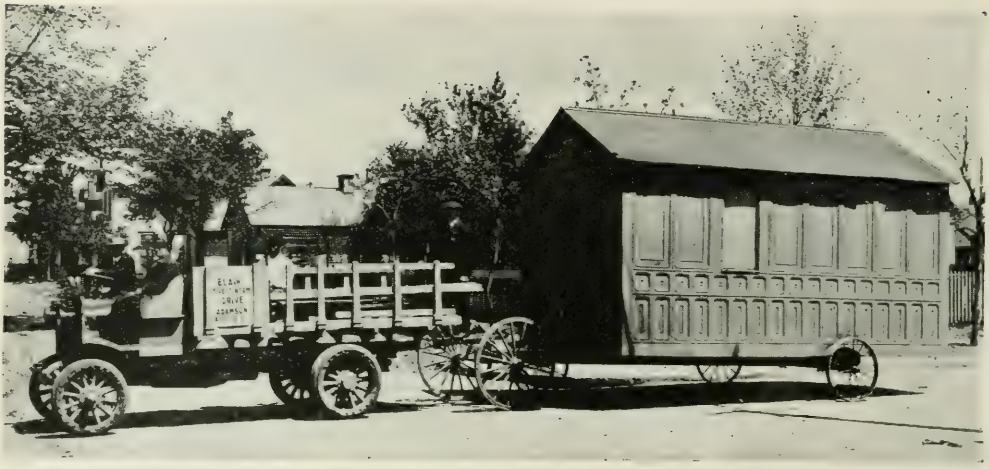
THESE are not views of the Panama Canal but of "coal strip pits" in Cherokee and Crawford counties, southeastern Kansas. A vein of coal varying in depth from eighteen inches to four feet lies under the surface in two-thirds of this district, and it is from nine feet to thirty feet down. As there is no rock roof above it, it cannot be mined in the ordinary way, so steam shovels and horses and scrapers are used to bare it. Fourteen shovels are in use for this purpose in these two counties, one of them being one of the largest ever built. It weighs three hundred tons and is said to be twice the size of the biggest one at work on the Panama Canal. It will strip ten or twelve acres to a depth of twenty-four feet in one year.

This method ruins land for agricultural purposes for many years but eventually will make it better, as a hardpan near the surface is broken. Strip pit mining leaves ridges, ditches and small ponds, but these will be leveled when land becomes more valuable.

WARSHIPS CAN'T BE LARGER

WHETHER conscious of it or not, the men behind the mammoth undertaking of designing and digging the Panama Canal are going to make it impossible for these nations of the earth that are planning for supremacy of the sea, to further increase the sizes of their battleships. The width of the Canal locks will limit the sizes of warships. The narrow strip of water soon to connect the two oceans, which will be of more importance to the civilized world than even the Suez Canal itself, at some time is sure to be in demand by all important nations. An unwieldly vessel with too long a beam makes it impossible for a short cut across the seas to be taken. Consequently all the plans of both this country and foreign ones to continue adding to the sizes of their warships with a view of making them a combination artillery corps, standing army and marine corps, are being changed. Recently, Great Britain, which planned to construct a dreadnought which in size and tonnage would eclipse any battleship

A STRIP PIT SHOWING SHOVEL, CARS, TRACKS, ETC.



MOVING A VOTING BOOTH TO A NEW SITE.

in the world, decided that a vessel with less than 100-foot beam is all that is necessary. The canal locks are 110 feet wide, and naval experts say that a clearance of at least five feet on either side is necessary.

MOVING VOTING BOOTHS BY AUTO

ONE of the novel uses to which the auto truck has been put is that of moving voting booths from one part of a city to another. This has been done in Columbus, Ohio. The truck shown conveyed in all 160 booths from one part of the city to another, thus accomplishing in seven days what it previously required several teams ten days to do. The booths averaged 3,000 pounds each in weight, and in being moved were placed upon a three-wheel truck. Four miles was the average distance each booth traveled. The saving in cost to the community was, of course, considerable.

HOW THEY WAIT IN LINE IN GERMANY TO BUY INFERIOR MEATS AT LOW PRICES.

NEW WAY TO CUT BEEF BILLS

THE high price of meat is felt so intensely in Germany, especially among the poorer classes, that the authorities have decided to come to their aid. They have opened a so-called "Freibank," where meat that has been condemned by the inspectors but is still fit to be eaten, is sold at very low prices. Although the "bank" opens at 6 a. m. crowds of people wait long before that hour in front of the store, to be the first ones served.

PLANTING SEEDS FOR UNCLE SAM.
A force of men at work sowing to white pine 8,000 acres of the national forest reserve near Cabinet, Idaho. The national forest was destroyed by fire in 1910.

BUILD FENCE TO SAVE FROM TOURISTS

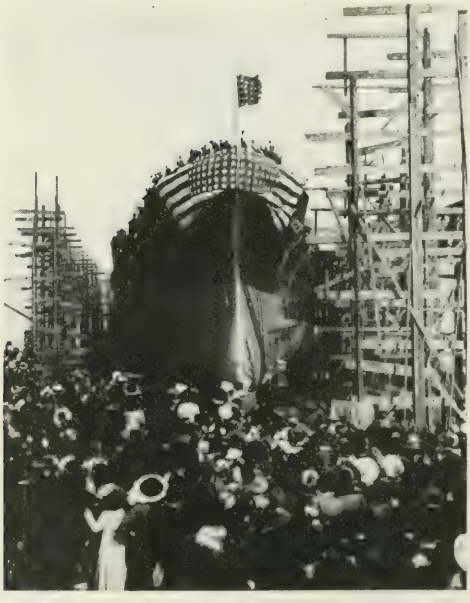
THE accompanying photograph represents a territorial monument marking the boundary between the United States and Mexico near San Diego, California. The monument is a marble slab and a fence had to be built around it to prevent tourists from chipping off the corners. It was not the original intention to have the fence but curiosity seekers began to destroy the slab before the work was fully completed. The monument is one of the type used on the borders of the United States.

THE FORCE OF SEED-PLANTERS AT REST.

FENCE GUARDS MONUMENT FROM VANDALS.

BERLIN'S FAMOUS BOY AND GIRL REGIMENTS OF SCOUTS AT THE SEASIDE MARCHING DOWN TO THE BEACH.

The boy scout movement has taken a tremendous hold on the Teutons.



VESSEL THAT WILL HELP US TO MAINTAIN OUR POSITION ON THE SEAS.

Mightiest of all dreadnoughts—the *New York*, as she appeared when launched recently. Her displacement is 27,000 tons.

SAWING LUMBER BY HAND

THE old-fashioned hand method of sawing logs into boards is still employed in China, and as labor is extremely cheap, it is much less expensive to have planks sawed by coolies than by saw mills. Hence saw-mills in south China are very rare indeed. A coolie's wages average but fifteen cents a day.

SAWING LUMBER BY HAND IN CHINA.

THIS SAGE-BRUSH DESERT COULD BE CONVERTED INTO VALUABLE AGRICULTURAL LAND, BUT LOCAL SENTIMENT WON'T PERMIT IT.

WHERE THEY WON'T CONSERVE

BY

GEORGE FREDERIC STRATTON

IN the far West conservation of natural resources has usually met with a grudgingly extended hand of welcome. Amid the great class of producers the one word "Conservation" brings the eyes together, forms deep horizontal furrows in the bronzed brows, and an expletive denunciation at governmental interference with business. The sheep-man scornfully and mournfully quotes the sizes of former flocks when forest reservation and timber conservation were unknown; and the dealers from whom he buys supplies sympathize with him. It is sheep, not timber that both are interested in. The miners, small and large, growl savagely and publicly at the restrictions on cutting timber for mine entries and tunnels; and the dealers in their supplies also sympathize, for with them Metal is King. The big broad meaning of true conservation is lost in the blanket of personal interest of immediate advantage. The dominant spirit of the West is, "today is today. When tomorrow comes we'll meet it."

Another view-point of conservation is not that only of the West or of the East, but of the entire world. It is the great impelling force of personal ambition, progress, and even of self-preservation. "My affairs are of more importance to me than the affairs of the other fellow." There is scant altruism in that, but it is the great impulse—even instinct—of mankind, and always has been. Thus it is that the fine future promise of conservation is considered but little by the men of the West, to whom the enforcement of its requirements sometimes compel a readjustment of existing plans; sometimes a relinquishment of existing advantages; although such readjustment and relinquishment frequently and quickly lead to greatly improved conditions.

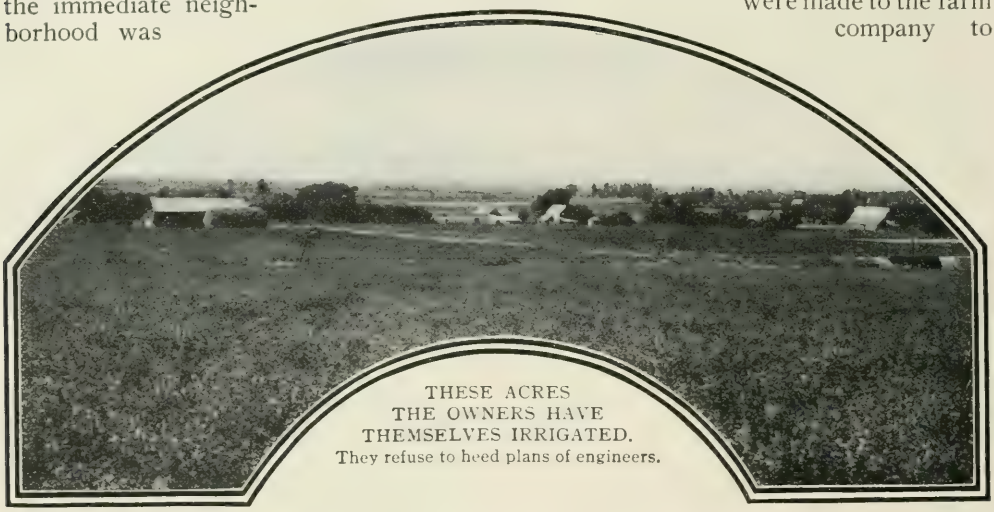
It takes a broader outlook to see advantage two or three years ahead of disadvantage, than is generally possessed by pioneers—men, who in their struggle with new country feel a right to enlist and appropriate every natural resource in that struggle. The

old bitter conflict of cow and sheep interests, and later the equally bitter fight of both against nesters, are examples; and the feelings which caused those conflicts are the same as those which arouse distrust and disapproval of authoritative systematic exploitation of the greatest good for the greatest number in natural resources.

One little concrete example is worth a volume of abstract reasoning. The Wasatch Mountains guard the eastern line of the Salt Lake Valley. From one of the canyons runs a small stream which, a dozen years ago, emptied into a restricted gully and wasted itself in subsoil seepage. The land in the immediate neighborhood was sage-brush desert, on which a few settlers fed sheep in the winter time, driving them back into the foothills for summer range. A few of these settlers thought of irrigation, and obtaining measurements of the stream, found sufficient water for about thirty-five hundred acres. The holders of the adjacent thirty-five hundred acres organized themselves into a regular company, allotting so many shares to each acre, with the agreement that every owner should pay for his allotted shares in labor or cash. An earth dam was built and a distributing canal dug during the first fall and winter, and within a year crops were growing on land which never before had cheered the eye of man with one glimpse of true green. Today that thirty-five hundred acres is unsurpassed in fertility and productiveness, and has risen in value from one and a quarter to three hundred dollars per acre, and over.

That is the result of conservation and reclamation, but under private management and with very restricted results, for that stream is capable of irrigating fully ten thousand acres instead of only thirty-five hundred. Irrigation is practiced during only five summer months, and as there is no reservoir, the water runs to waste for the seven months when the flow is by far the most generous.

Three years ago, propositions were made to the farm company to build a reservoir, conserve the winter supply of water, and by canal extension irrigate other land; but the proposition was determinedly opposed. The owners would listen to no scientific certainties of ample supply. They saw only sufficient for themselves under the crude engineering, and curtly refused to listen to any further development, although a fair payment was offered for the utilization of that waste water. Presentation of the fact that the great increase in the value of the surrounding land would be reflected in the value increase of their own land, was ignored. Today, six or seven thousand acres of the finest garden soil of the West is desert while water runs to waste.



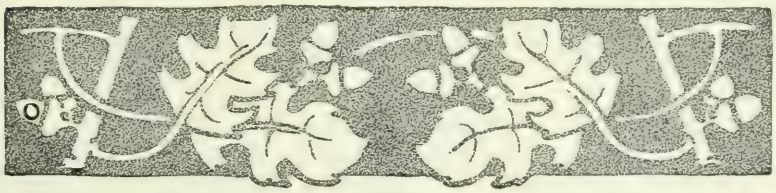
THESE ACRES
THE OWNERS HAVE
THEMSELVES IRRIGATED.
They refuse to heed plans of engineers.

This may appear to be an insignifi-

cant example, but it is one of many, and looked at fairly it gives as drastic and complete a picture of a not uncommon attitude towards the true development of conservation, as if the statistics were increased ten or twenty fold. "My affairs are of more importance to me than the affairs of the other fellow."

Under authoritative direction—under advanced conservation methods—that little stream would do its full duty; and although the limit of that duty would be the irrigation of ten thousand acres, it carries as forceful a lesson of the broad far-reaching principles of conservation and the narrow view-point of much criticism as if the utilization of a great mountain torrent and the reclamation of a half-million acres was involved.

The same feeling regarding water exists regarding timber and minerals; and that feeling has been largely encouraged by men whose schemes for securing gigantic advantages have been thwarted by the policy of National Conservation.



At the beginning of the cask and at the end take thy fill, but be saving in the middle, for at the bottom saving comes too late. Let the price fixed with a friend be sufficient, and even dealing with a brother call in witnesses, but laughingly.

—*Hesiod*

RUBBER SHRUB IN BALES

CUTTING and baling the guayule shrub has become an important industry in some portions of northern

How the Valuable Guayule Rubber Shrub is Stacked.

Mexico. Large quantities of crude rubber are obtained from this shrub. The industry has assumed very large proportions during the last few years. It is estimated that there are more than $60,000,000 of American capital invested in guayule shrub lands and in rubber factories in Mexico. Large stocks of the baled shrub are kept on hand at the different factories and upon the ranches where it grows wild. The bales are often piled in great ricks which resemble at a distance stacks of baled hay or straw.

Running a Carload of Fruit-Laden Baskets Down to the Wharf.

PIER FOR LOADING FRUIT

THE accompanying picture shows a somewhat unusual equipment for loading fruit on a steamer, in Michigan. The pier, as shown, extends about 1,000 feet out into Lake Michigan. On top is a T-rail track on which two wide-platform cars are operated by gravity. The speed is controlled by a brake lever on the car.

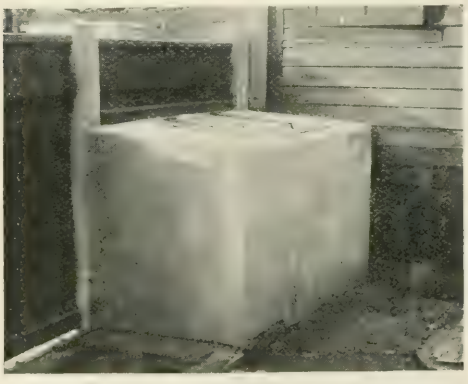
While one car is being unloaded the other is being loaded in the storage house. No fruit is put out on the dock until the boat is in sight.

This contrivance has a record of three million fifth-bushel baskets of peaches in a single season, and this year it handled the larger part of 100,000 barrels of apples.

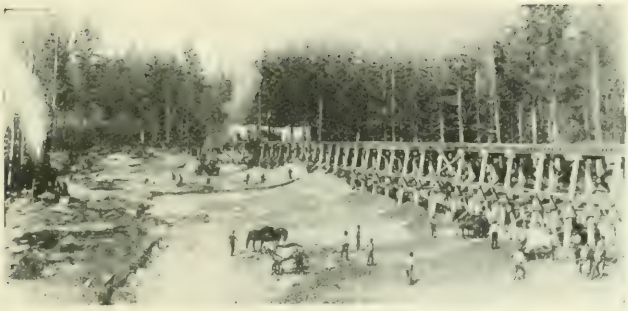
ASH BOX OF CEMENT

ONE of Chicago's citizens has contrived a cement ash box. The ashes are dumped through the opening on the top, ordinarily kept closed by means of a sheet-iron door. The box side is flush with the outside of the fence, and in this side is another sheet-iron door on stout hinges. The ash man simply opens the side door and shovels the ashes into his wagon. The bottom of the box also is of concrete. The box is stationary.

Special Pier for Loading Great-Lake Steamers with Fruit.



A Concrete Ash Box—Substantial and Convenient.



Building the Dam for the White River Power Project.

HUGE POWER PLANT IN THE CASCADES

TO supply electricity to the cities of Seattle, Tacoma, and Everett, a power company is now constructing a water plant on the White river, in the Cascade mountains, that with the exception of one at Niagara Falls, will probably be the largest of its kind in the country.

When equipped with temporary machinery it is designed to produce 36,000 horsepower, but when eventually harnessed to capacity, the designing and superintending engineer says it will supply 108,000 horsepower.

Lake Tapps, Where the Water Is to Be Impounded to Serve the Huge Power Plant.

To accomplish this result the company now has more than 600 men, six steam shovels, and scores of teams engaged in the work of harnessing the White river, digging canals deep and wide enough to float an ocean-going vessel, and driving a tunnel nearly two miles long through the heart of a mountain.

Diverting the entire stream of the White river from its channel, at a point one-half mile above the town of Buckley, a canal eight miles in length will carry it to the natural basin in which Lake Tapps is located. Here the water will be impounded, and sent thence through the mountain tunnel to the power house near the Northern Pacific railway station of Derringer, nearly two miles east of Lake Tapps.

At this point the stream, after performing its duty as a power producer, will be returned to its natural bed. It is estimated that the water will be delivered to the machinery in the power house under an effective head of 450 feet, or about 195 pounds pressure to the square inch.

WORLD'S LARGEST DOCK, AT SPITHEAD—PORTSMOUTH—ENGLAND.
It has a length of 700 feet, a width at entrance of 150 feet. Its lifting capacity is 40,000 tons. This dock will be able to take the largest superdreadnought yet built or designed.

DR. M. J. ROSENAU.
He believes the stable fly is a carrier of the terrible infantile paralysis.

FLY GUILTY OF ANOTHER CRIME?

By

RENÉ BACHE

IS the common biting stable-fly accountable for the spread of that frightful and mysterious disease, infantile paralysis?

In an address before the Health Congress at Washington recently, Dr. Milton J. Rosenau, Professor of Preventive Medicine in the Harvard Medical School, gave an account of certain experiments performed by himself which seemed to fix the guilt upon that insect—to prove, in other words, that the stable-fly—known to science as *Stomoxys calcitrans*—is the carrier of the malady in question.

To prove this, Dr. Rosenau took a portion of the spinal cord of a person who had died of the disease, and injected it into the veins of monkeys. The latter soon developed infantile paralysis, and then a number of stable-flies were put into the cages with them, mosquito-net being used to prevent their escaping. When they had had time to bite the monkeys, and thus—if the theory of the experiment was correct—the simians had become infected, they were transferred to other cages containing healthy monkeys.

As a result, the healthy monkeys were taken with the malady—the inference, seemingly inevitable, being that the flies sucked infected blood from the sick monkeys and afterwards introduced the germs into the blood of the well monkeys by biting them. Such being the case, the stable-fly must be a carrier—perhaps the only carrier—of infantile paralysis—*Q. E. D.*

Such a discovery is necessarily of utmost importance. But, unfortunately,

there is a possible loophole for mistake. It is at least very likely that the stable-fly is the carrier of the disease, but the case is not absolutely proved against it.

Why?

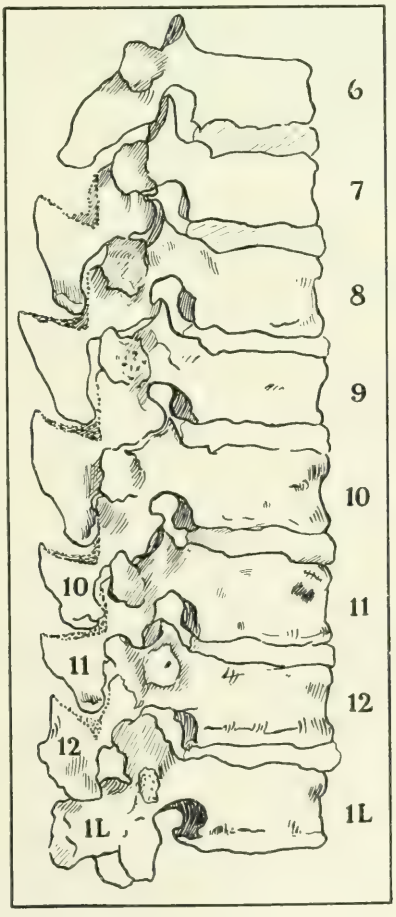
Simply because the flies in the cages with the sick monkeys had access not only to the monkeys themselves, but also to their *dejecta*. Now, it is well known that the *dejecta* of human or other sufferers from infantile paralysis always contain quantities of the germs of the disease. Thus it is altogether within the limits of possibility that the insects carried the germs on their legs or bodies to the well monkeys, communicating the infection in this way, and not by biting.

It is a question between mechanical transmission, in other words, and biologic transmission. If, as above suggested, the transmission was merely mechanical, the infection might be conveyed in any one of a thousand other ways, and the stable-fly could not be called, in the ordinary sense of the term, a "carrier."

The stable-fly, having been found guilty, has appealed its case and will have a new trial.

It is an insect with which most of us are very well acquainted. Like the housefly, it breeds in stables and in waste vegetable matter. Its size is about the same, and to the casual observer it looks so much like the housefly as to be hardly distinguishable from the latter. But whereas the housefly is a licking fly, without mouth-parts for biting, *Stomoxys calcitrans* is provided with a formidable beak terminating in sharp jaws, and is a blood-sucker.

THE STABLE-FLY HAS A BITING BEAK AND PECULIAR BACK MARKINGS.



SHOWING HOW INFANTILE PARALYSIS ATTACKS THE SPINAL VERTEBRAE.

Luckily for us—the insect's "nip" being quite severe—it rarely comes into dwelling houses. But it is a frequenter of stables, and greatly afflicts horses.

Within the last half-dozen years there has been a great deal of infantile paralysis in the State of Massachusetts. Springfield and Fall River have been the centers of quite alarming epidemics of the malady, which has incidentally found many victims in towns round about those cities. There has also been a minor epidemic center in Boston.

This state of affairs led to an investigation by the Massachusetts health authorities, which has been very comprehensive. The disease is notably sporadic in character—appearing, that is to say, here and there, without any obvious connection between the cases. It seems to be exceptional for more than one person in a family to contract it—which points, obviously, to the conclusion that it is not contagious in the ordi-

nary sense. The malady shows no tendency to spread among children when the latter are kept together in numbers, at school or elsewhere.

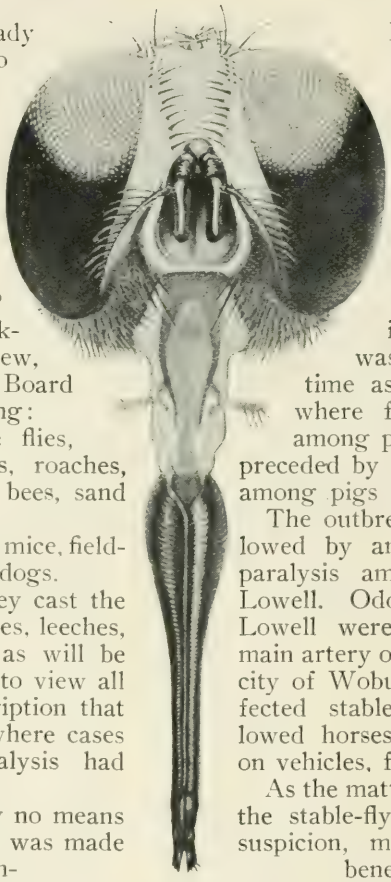
These facts strongly suggest some insect or other carrier of the complaint. But how to fix the guilt where it belongs?—that is the question. Taking all possibilities into view, the Massachusetts Health Board has considered the following:

Among insects — house flies, mosquitoes, ants, bedbugs, roaches, spiders, biting flies, fleas, bees, sand fleas, and crickets.

Among mammals—rats, mice, field-mice, squirrels, cats, and dogs.

In addition to these, they cast the eye of suspicion upon snakes, leeches, and goldfish. The idea, as will be understood, was to take into view all animals of whatever description that were found in dwellings where cases of human infantile paralysis had made their appearance.

That the complaint is by no means restricted to human beings was made manifest by statewide inquiries, covering a large number of towns.



FRONT OF HEAD OF STABLE FLY.
The biting beak is plainly in evidence.

In ten towns horses were found to have died recently of the disease. Many horses had succumbed to it in North Adams, particularly, and a number of colts in Pittsfield and its neighborhood had died of it—five or six on one farm within a few weeks.

In two towns pigs had been attacked, the outbreak at Brockton being specially severe.

In three towns chickens had suffered. On a poultry farm at Westminster there had been thirty or more cases in one season, and on an adjoining farm ten cases. Beverly complained of an epidemic of paralysis among game fowls.

In seven towns dogs were attacked. One owner in the vicinity of Reading lost six cocker spaniels in a month.

In four towns cats were victims. There were a number of cases among pussies at Lynn.

In five towns cattle perished of the malady. Beverly lost fifteen cows by it.

In some instances the circumstances seemed to point to a connection between cases in animals and cases in human beings. For example, at Lowell, in one family, a cat was paralyzed at the same time as a child. At Woburn, where fourteen cases occurred among people, the outbreak was preceded by an epidemic of paralysis among pigs and cats.

The outbreak at Woburn was followed by an epidemic of infantile paralysis among human beings in Lowell. Oddly enough, the cases in Lowell were distributed along the main artery of traffic leading from the city of Woburn—suggesting that infected stable-flies might have followed horses, or have been carried on vehicles, from Woburn to Lowell.

As the matter now stands, however, the stable-fly, while under grievous suspicion, may at least claim the benefit of what in law is called a "reasonable doubt."

If he is guilty, he cannot possibly escape ultimate conviction. Supposing the charge to be finally proved against him, a strong additional reason will be furnished for preventing, through the rigid enforcement of health ordinances, the wholesale breeding of flies, whether of the house or stable species, in stables. Sanitary precautions must be taken to prevent this.

Meanwhile infantile paralysis—known to science as "anterior-poliomyelitis"—remains to a great extent a mystery. It attacks certain columns of cells of gray nerve-stuff that run up and down the spinal cord. Sometimes it destroys them, and permanent paralysis ensues; for these cells control the movement of various muscles of the body. Sometimes the legs are paralyzed, temporarily or otherwise; sometimes the arms, or any other muscles—even those of the abdomen, or of the face. Occasionally the malady makes

a person cross-eyed by affecting the eye-muscles. The part paralyzed depends upon the location of the cells attacked.

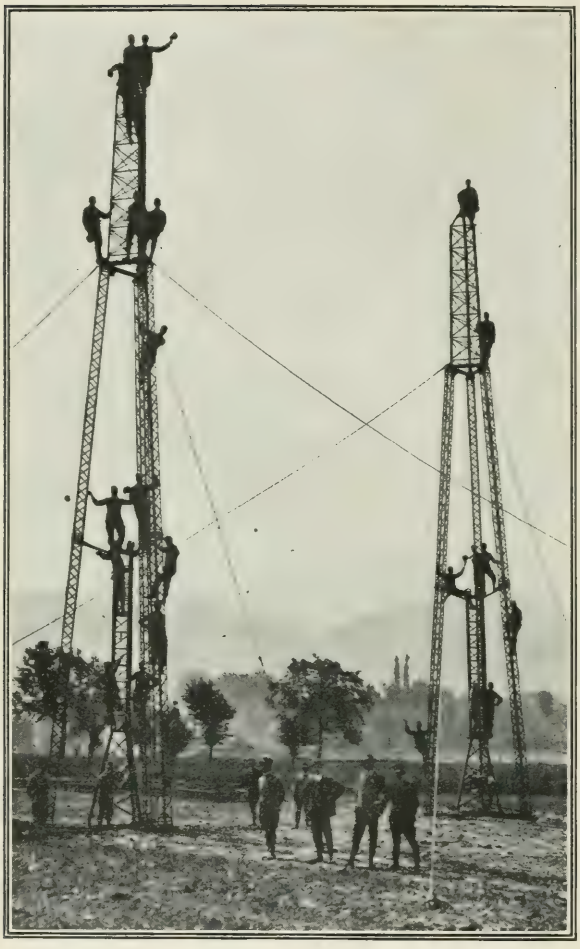
Nine out of ten cases occur in children or very young people. Usually the attack is ushered in by fever. Other symptoms are very various, including digestive disturbances, muscular pains, bladder trouble, and even brain disorder. Recovery may be in a week or less, or may be postponed for two or three years. Many who escape death are disabled for life.

The germs of infantile paralysis are found in large numbers in the nose and upper throat of the sufferer. It has been proved by experiments that the disease can be transmitted from one monkey to another by the nasal secretions. This fact would suggest that it must often be communicated directly from one human being to another, inasmuch as the germs, distributed by sneezing, are likely to find their way into the air, and to be taken into the breathing passages of healthy people. And so the endless chain of contagion is continued.

Some people are so fond of ill-luck that they run half-way to meet it.

The ugliest of trades have their moments of pleasure. Now if I were a grave-digger, or even a hangman, there are some people I could work for with a great deal of enjoyment.

—*Douglas Jerrold.*



PUTTING UP THE MAIN SUPPORTS OF THE MOVABLE HANGAR.

HANGAR THAT CAN BE MOVED

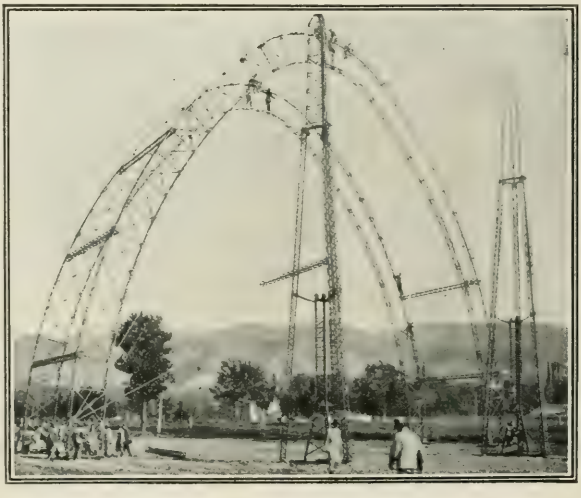
THE transportation hangar shown in the accompanying illustrations for dirigible balloons, is an Italian device recently constructed. It has a width at the base of about 95 feet and a height of about 78 feet. The length may vary according to the number of arches used. However, the present design is about 260 feet long. This type of balloon sheds is one of the latest adopted by the Italian army.

It will be seen that all the skeleton work is of steel and iron, with a fabric covering. The sections of the frame-work are fastened together by interfitting joints, which are then rigidly held together by pins. The arches are assembled on the ground and then raised. By using a hinge principle of joining the parts together, as well as for the bases of the arch, the entire structure can be rapidly assembled or demounted, and, when completed, forms a strong wind-resisting housing place for airships.

The lack of proper hangar facilities has been one of the greatest drawbacks against the more extensive use of dirigibles, and with this disadvantage removed, it is quite probable that they will figure more prominently in the military aeronautics of Italy and other nations than has been the case in the past.

In order to erect the first arch a pair of towers are required to take the ropes and aid in uprearing the structure. It takes but twenty cars to transport the hangar which can be raised in two days' time.

The hinge contrivance is of course the characteristic feature of the system, all sections being assembled with unusual ease.



THE SKELETON WORK IS BENT INTO THE FORM OF ARCHES.

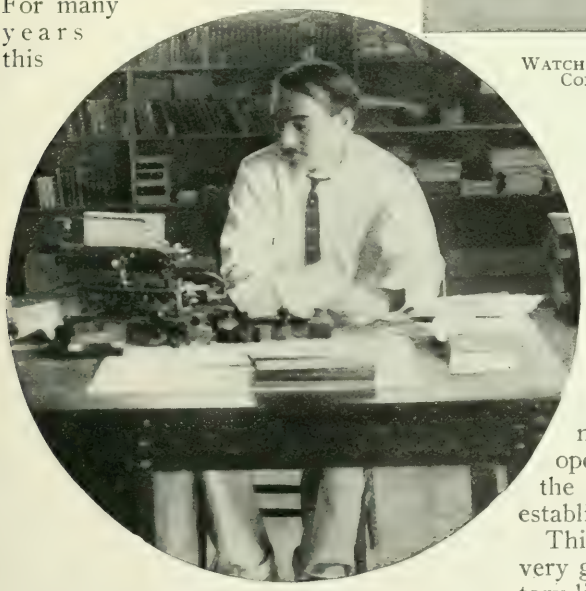
BUILDS UP BUSINESS IN PRISON

A BUSINESS which pays $5,000 a year is conducted out in Arizona under circumstances that are probably unique. A convict, Louis V. Eytinge, serving a life-sentence in the State prison at Florence, is the founder and manager of the concern, and a large number of his fellow prisoners are the workers and profit sharers. Many of these convicts are former cowboys of the range, who, when at large, found solace for the evenings about the camp fire in weaving and braiding little trinkets of horsehair. Hat bands, watch fobs, and chains, and even elaborate bridles and stout reatas, are made by their clever fingers, and when contrasting colors of horsehair are used, the effect is very striking.

This art is now taught to the convicts in Arizona, and after their day's work for the State is done, they are at liberty to make and sell these things for their own profit.

WATCH FOBS OF HORSEHAIR AND SILVER, WOVEN BY CONVICTS IN ARIZONA STATE PENITENTIARY.

For many years this custom was followed, the sales being made a few cents worth at a time to such visitors as happened to enter the prison, but it was the capable and business-like Eytinge, who made a steady and profitable business out of this amusement. First he developed a mail-order business, selling direct to people interested in such curios, but finding that this market was limited, he has developed a wholesale trade, dealing with the proprietors of curio and novelty establishments.



LOUIS V. EYTINGE.
A life prisoner in the penitentiary at Florence, Arizona, who has organized a business in his cell.

This increased the volume of business very greatly, and was followed by a factory-like standardization of the output. Business stationery was printed, bearing the address "Box B, Florence, Arizona."

CURB MARKET FOR AUTO SUPPLIES

THE thirsty automobile entering a strange town in search of its life-giving gasoline can now sight, at a distance, the oasis from which refreshment may be secured. Because of a new invention the garage man may now place his gasoline pump on the curb, instead of requiring his men to carry great canfuls from the rear of the shop. At the same time he advertises his business in a most attractive manner by night and by day, as will be seen from the illustration, for the circular sign at the top can be illuminated at night by means of electric light bulbs inside.

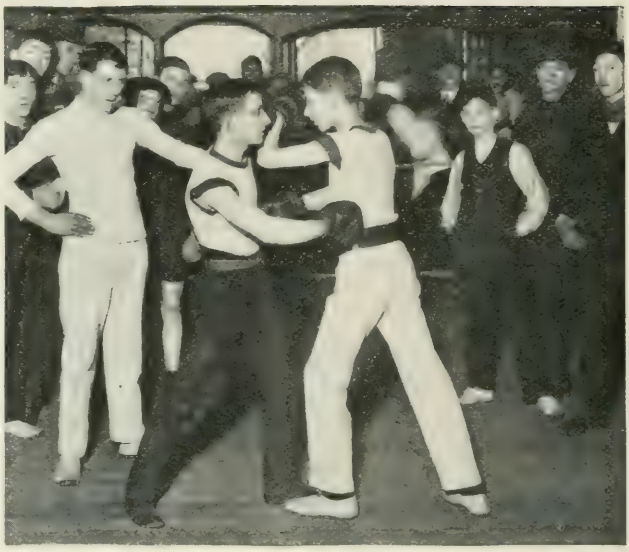
The column upon which the sign rests is merely a cast-iron casing, housing a self-measuring gasoline tank. A short length of hose connects the pump with the gasoline tank of the auto, and by simply turning the handle, any quantity of fluid gas desired can be injected into the tank.

The supply of gasoline from which the pump draws, is held in a reservoir under the sidewalk so that it is out of reach of fire and does not endanger the buildings about it.

The reservoir may be filled through a supply pipe under a cover in the sidewalk.

Besides gasoline the curb equipment may be fitted to supply compressed air for tires and water for the car's radiator, the last two being supplied free to gasoline customers.

CURB MARKET FOR AUTO SUPPLIES.



HEALTH CULTURE AT FOUR CENTS A NIGHT.
The kidney punch.

CHEAP BOXING

SHOREDITCH, England, has opened a boxing club. Instructors have been engaged. Anyone wishing to develop into a boxing champion has only to pay his twopence per night.

COMPLETED GRADE TUNNEL, FOR NEW YORK CITY'S NEW WATERWORKS SYSTEM, IN THE VICINITY OF HIGH FALLS.

MEASURING WATER AND SAVING MILLIONS

By

JOHN E. WHITMAN

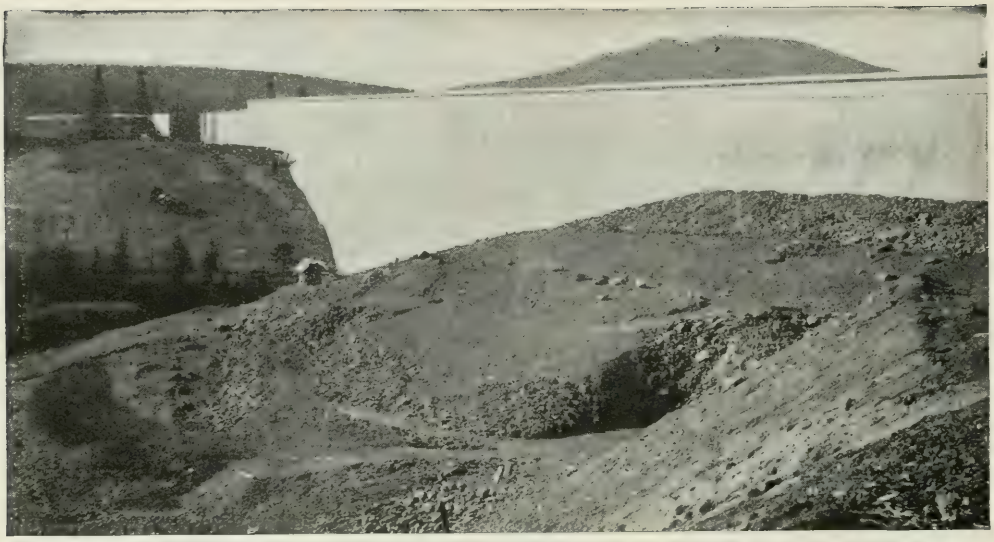
KALAMAZOO, Michigan, is famous for one thing at least, —its name. It should be famous for another thing—though it isn't—as its population increases the less water it consumes.

A comparison of the figures for the fiscal years ending, respectively, March 31, 1893, and March 31, 1911, indicate an astounding divergence:

	Year Ending March 31, 1893	Year ending March 31, 1911
Total gallons pumped	787,621,902	710,474,683
Population	18,000	40,000
Revenue from water	$15,000	$38,000
Number of services	2,500	5,300

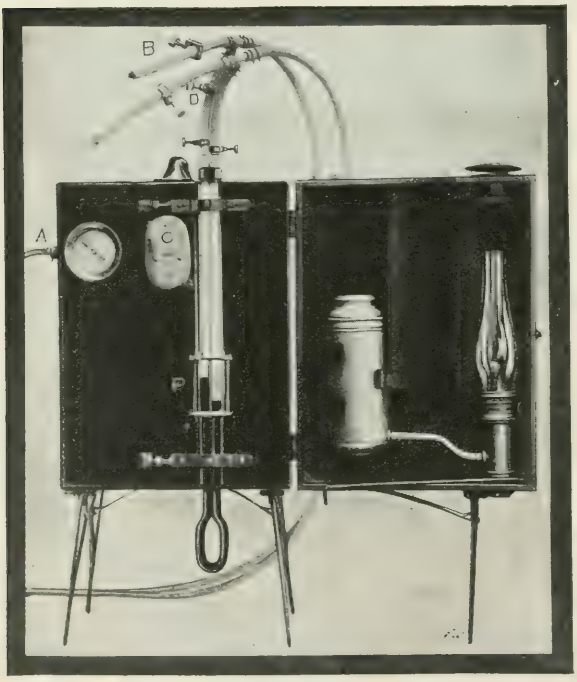
The figures unmistakably show this: that with a population somewhat more than doubled—with more than twice the number of services, the revenue from the plant increased over 150 per cent and the quantity of water consumed fell off more than seventy-seven million gallons annually. All of which simply means that back in 1893 the waste was relatively enormous, and that the pumping plant was being sadly overworked to no purpose whatsoever. No other conclusion, it is quite evident, can possibly be deduced.

Incidentally, this great saving between



MAIN MASONRY PORTIONS OF THE GREAT ASHOKAN DAM.

the years 1893 and 1911 was accompanied by a ten per cent reduction in the rate charged. During this period of eighteen years, the City Council of Kalamazoo passed ordinances with reference to the installation of water meters for each separate service, so that the consumer in every instance would be compelled to pay according to the number of gallons he might consume. Two such ordinances having failed to accomplish the complete results desired, a third, more drastic than its predecessors, put through in the early months of 1910, covered every contingency and permitted of no evasion. The record of 1911, so remarkable as against that of 1893, was the result.



THE PITOMETER—A RECORDING MECHANISM FOR WASTE WATER SURVEYS.

Kalamazoo, in its misuse of its water supply, was probably no different than most of the cities, towns, and villages in the United States. It is cited here, first because its figures are so striking and so clear; second because these figures, for so long a period, had been so carefully and accurately kept; and third for the reason that this Michigan city doesn't do municipal business on too large a scale to prohibit its procedure from being analyzed down to the last detail, nor on too small a scale to deprive the results of significance. Kalamazoo, with reference to its water supply, has

been gauged as accurately as if by a laboratory test.

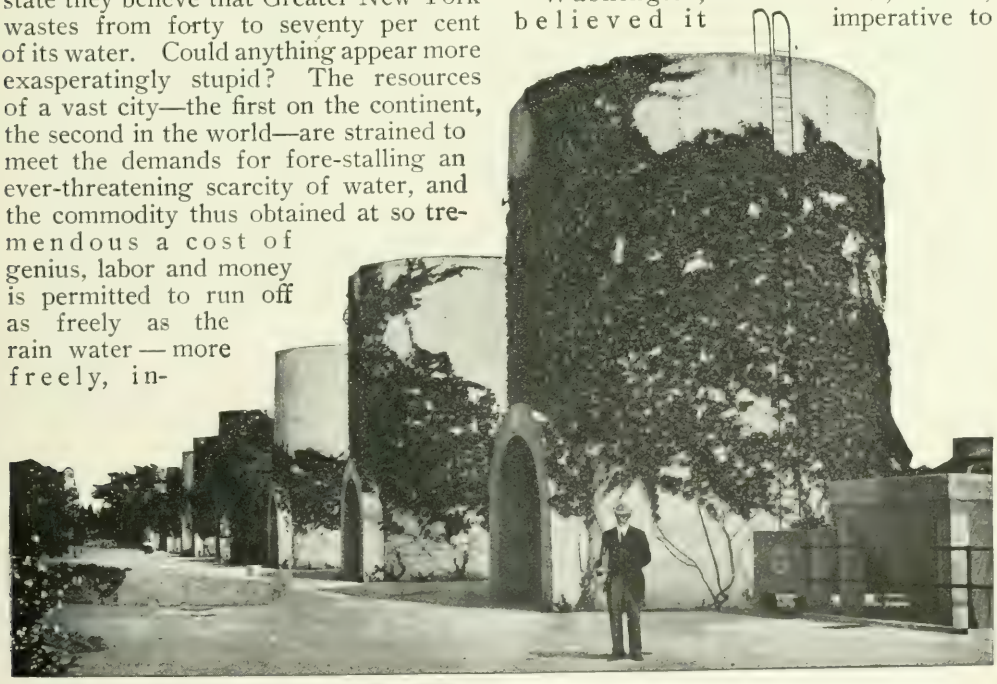
New York City evidently takes a tremendous pride in its water works system. It is willing to go to almost any expense—especially when such expense can be met by issuing bonds that posterity must pay for—to secure a good and plentiful supply of water. Its engineering schemes for this purpose have been of proportions so gigantic as to dazzle the imagination. The great Ashokan Dam system, recently completed at a cost of over one hundred million dollars, submerges, in the Catskill mountains, some fifteen thousand acres of land. It has added to Greater New York a daily supply of a quarter of a billion gallons. Among the engineering feats accomplished in putting this gigantic undertaking through were a conduit through the mountains, the huge inverted siphon at Storm King, two reservoirs east of the Hudson River, and two tunnels beneath the East River.

CABIN JOHN'S BRIDGE.
This span carries through a nine foot pipe the entire water supply of the city of Washington.

Yet conceive it, if you can—engineers state they believe that Greater New York wastes from forty to seventy per cent of its water. Could anything appear more exasperatingly stupid? The resources of a vast city—the first on the continent, the second in the world—are strained to meet the demands for fore-stalling an ever-threatening scarcity of water, and the commodity thus obtained at so tremendous a cost of genius, labor and money is permitted to run off as freely as the rain water — more freely, indeed, for sewers are by no means always in the best condition to serve their purpose.

The American seems no more capable of conserving his city's water supply than is a lumber baron the forests. He has nearly always had it and almost for the asking. Water to him seems as free as air—which, incidentally, is not so free, in these days of congested slums, lofty buildings, and smoky factory chimneys, as it used to be. He cannot begin to appreciate its proper value until made to pay for it at so much per cubic foot.

Washington, D.C., in 1910, believed it imperative to



CONCRETE TANKS FOR STORAGE OF CLEANED SAND AT THE FILTRATION PLANT IN WASHINGTON

extend its water system. On investigation, however, it was found that one-tenth of the daily supply was lost. This timely discovery has enabled the Capital City to postpone an expenditure of $5,000,000 for another twenty years.

Under the circumstances it looks as if New York City with its waste, estimated from nearly half to nearly three-quarters of its potential supply, was really under no necessity of building the Ashokan reservoir, for many years to come, at least.

By introducing meters, New York City is beginning to save some of this waste. The mean daily loss from the carelessness or indifference of householders, the meters show, amounted to 15,728,000 gallons. At the rate of ten cents a hundred cubic feet this means a saving in money of about $1,825,000 annually.

The waste by householders, however, is but a mere drop in the bucket. Underground leakage is the chief cause. Recent tests in New York with an instrument called the pitometer show this. The pitometer measures how much water is actually running at any given time through the mains, by measuring the velocity of the flow.

Greater New York's total water supply, estimated at one billion gallons daily, comes from twenty-five originally different systems. In 1890, New York City had a population of one and a half millions. Since then Long Island and Staten Island boroughs — including Brooklyn—have been added. Greater New York has thus inherited the various water plants of these formerly independent municipalities. Parts of the system are very old indeed, and the causes of the escape of the water vary from abandoned service pipes and dead ends to fractured mains and imperfect connections.

This condition of water waste and water leakage can be found almost everywhere. Boston's waste is placed at fifty per cent, Washington's before 1910 was placed at about ten per cent. Of Chicago, it is stated that T. C. Phillips, Engineer of Water Surveys, reported in 1908, that "the total loss of water in the districts surveyed amounts to from seventy to eighty per cent of the total supply." Today the western and southwestern areas of Chicago,—scattered out over the prairies,—are deficient in water supply. In many of the apartment buildings,—even those comparatively close to Lake Michigan—the source of the city's supply—not a drop is available during a large portion of the day, in summer time, on the third and higher floors. The Stockyards section is largely without protection from fire through this lack. About a year ago, Fire Chief Horan and a number of his men lost their lives while fighting a conflagration in the Stockyards district. Want of water with which to fight the flames was given as the principal reason for this unnecessary sacrifice.

Los Angeles, the pride of southern California, has recently completed one of the most remarkable water systems in the world. Across the Mojave desert the precious fluid is brought through flumes, siphons, and tunneled mountains, a distance of two hundred and fifty miles, from the Owens river in the Sierras, twelve thousand feet above sea level. "A long look for water," as they say in the desert. This system can deliver from two hundred and fifty to three hundred millions gallons daily. Its cost is close to twenty-five millions. And yet, will Los Angeles be as negligent as New York, Boston, and Chicago have been, or will she follow the example of that vigilant and justly famous little city, Kalamazoo, Michigan?

PIGEON RACE IN ENGLAND ON AN ENORMOUS SCALE.
Five thousand homing pigeons leaving the Crystal Palace in a single contest.

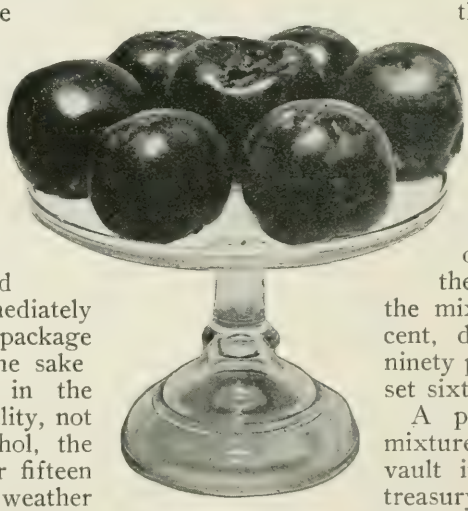
READY FOR THE GERMAN INVASION FROM THE SKY.
A squad of England's army aeroplanes at Hendon drawn up and being inspected by a field commander.

THE "PUCKERLESS" PERSIMMON

THE popularity of the oriental persimmon is not nearly so great as it deserves to be, and a delicious, nutritious, easily grown and readily profitable fruit is almost unknown in the American markets. The chief reason is that one thinks of a persimmon as a small, squashy fruit of many seeds and disagreeable pucker; Americans have not learned to prepare the fruit as do the Japanese, removing the tannin and leaving it almost as firm and hard as apples. So far, the few experiments made have not demonstrated that the native American "wild" persimmon can be produced with entire success.

ORDINARY "SQUASHY" PERSIMMONS AS USUALLY FOUND IN THE MARKET.

The method followed in Japan and China for removing the tannin and making hard and firm the ripe persimmon is, scientifically, somewhat crude, but eminently practical and effective. The ripe fruit is merely packed in casks which have contained *sake,* the Japanese wine, the head of the cask being immediately put in place and the package made air-tight. If the sake previously contained in the casks was of pure quality, not adulterated with alcohol, the fruit, in five, eight, or fifteen days, according as the weather may be quite warm or less so, may be removed from the cask in a firm, sound condition, and may be handled and shipped in about the same manner as apples. The flavor is fine, and the astringency has entirely disappeared. Many other processing methods have been tried in Japan, but none excepting the one described has proved entirely successful. If the fruit comes in contact with the fumes of alcohol, it will appear to be all right when the package is opened, but will, in a few days, turn black and be utterly ruined. The casks used are made from Cryptomeria wood, which closely resembles cypress, and is quite soft and tasteless. If, upon first opening a cask, the fruit is found not quite cured, the head is replaced as quickly as possible, two small holes are made and blown through, to remove the outer air from the top layer of fruit, and the holes tightly plugged.



FINE LARGE "PUCKERLESS" PERSIMMONS.

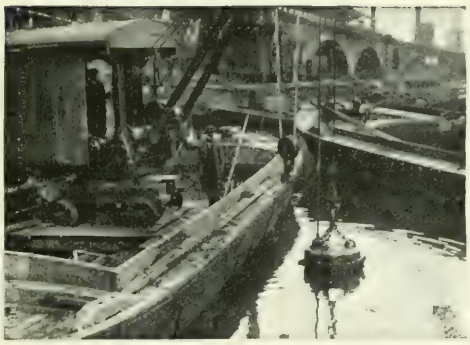
OIL FOR WATERPROOF CONCRETE

BY an elaborate series of experiments Mr. L. W. Page has demonstrated that concrete and cement mortar may be made absolutely impervious to water under a pressure of forty pounds to the square inch by the addition of ten per cent of oil. The oil, however, reduces the crushing strength of the mixture twenty-five per cent, delays the initial set ninety per cent, and the final set sixty per cent.

A practical test of the mixture has been made in a vault in the United States treasury, at Washington. This vault had been rendered useless by seepage, which it had been found impossible to stop. A lining of concrete, to which ten per cent of oil was added in the mixing, has made the vault perfectly water-tight. Other practical tests in other places have proved equally satisfactory.

MAGNET RECOVERS SUNKEN IRON

AT the shipping wharf of an iron manufacturing company in England, it was decided to recover from the water a large quantity of scrap-iron which has fallen in while barges were being loaded and unloaded. Dredgers and divers have been unable to get this material up from its bed of mud, but the difficulty was overcome by installing a lifting magnet on the barge crane. This plan proved successful. Several tons of material per hour were raised from a depth of sixteen feet of water. The mud into which the scrap-iron had sunk was two or three feet in depth. About one hundred tons were recovered in seven days at intermittent work, the amount of scrap brought up at each lift varying from four hundred to six hundred pounds.



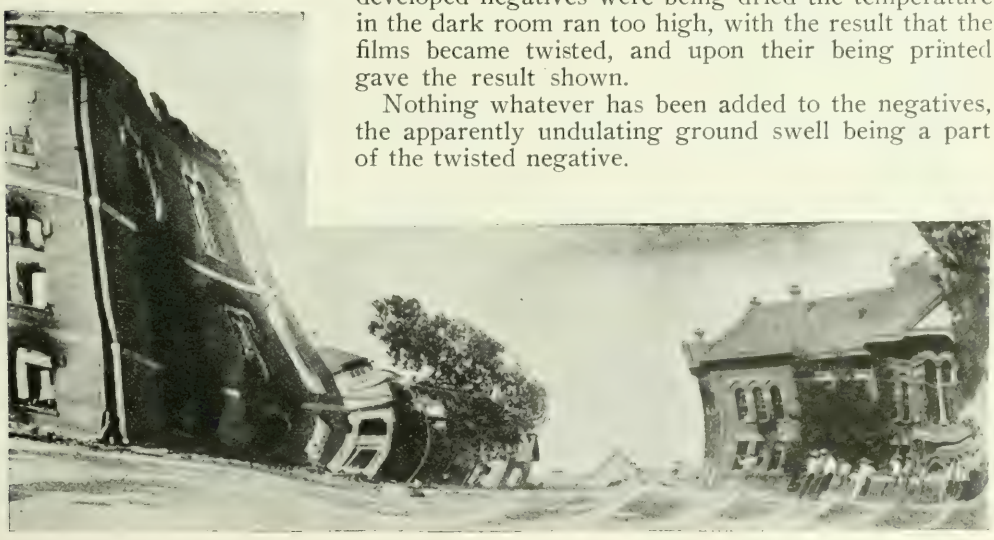
SUBMARINE LIFTING MAGNET RECOVERING SUNKEN SCRAP IRON.

A VERY WOBBLY EFFECT.

CAMERA AGAIN LIES

THE accompanying very peculiar photographs were taken on the campus of the Texas Agricultural and Mechanical College, College Station, Texas, just after the destruction of the Administration building by fire. While the developed negatives were being dried the temperature in the dark room ran too high, with the result that the films became twisted, and upon their being printed gave the result shown.

Nothing whatever has been added to the negatives, the apparently undulating ground swell being a part of the twisted negative.



NOT REALLY THE FAULT OF THE CAMERA.

AN OUTDOOR SALESROOM

A FIRM on Broadway, Los Angeles, that is engaged in the business of selling records for phonographs, has shown how waste land may be turned into an asset. The back court of its place of business has been planted as a garden, and set out with rare and beautiful plants about a fountain. Comfortable benches have been provided for patrons, and Navajo rugs are placed on the seats and about the grounds when the weather is fair. Curios such as Indian *metates* of stone and odd bronzes from the Orient are scattered about, and the whole garden is covered with a pergola and provided with electric lights for use in the evenings. Here are sold more records than in the show rooms of the store, for quite a number of customers, in charge of a couple of salesmen, can be waited on at a time, and the beautiful surroundings tempt the patron to linger and listen to the records and order more than he first intended to purchase. As the public is made welcome, whether buying or not, many office workers in the neighborhood drop in during the lunch hour, and a large proportion of them become customers. The garden quickly paid for its first cost.

THE TYPE OF AIRSHIP BEING USED IN THE ENGLISH ARMY TODAY.
Beta 2, on her flight from Cambridge.

AN OUTDOOR SALESROOM THAT DRAWS TRADE.

WEED TURNED TO PROFIT

By

FORREST CRISSEY

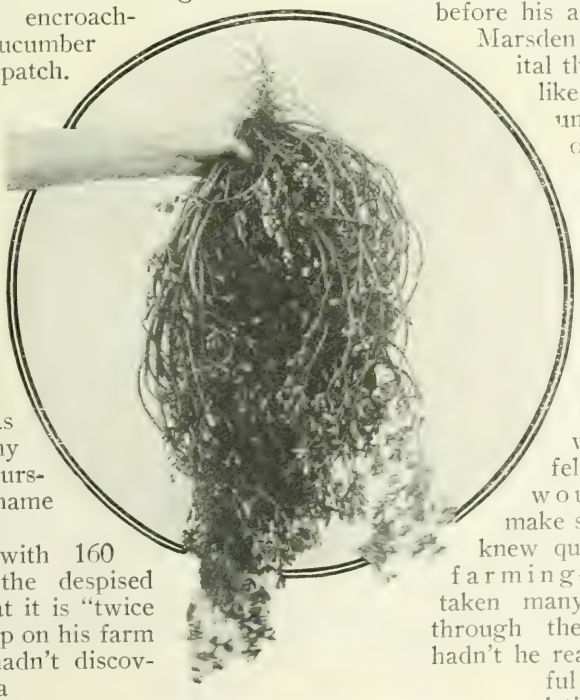
OUT in Nebraska, about sixteen miles north of Benkleman, is a farmer named Philip Marsden who has one hundred and sixty acres in a weed that has been generously cursed by every gardener since the days of the Pilgrim Fathers and abhorred by every boy that has ever been sentenced to pull weeds in the garden or the potato patch. Its meanness has even passed into a phrase that has been used by the American farmer for upwards of a hundred years as a figure of persistent spreading and insolent contemptability.

"Meaner than pussley," is the phrase—and it carries with it a wealth of suggestion to those who have struggled against its encroachments in the cucumber or the potato patch. There are various and more scientific names for this weed than "pussley"—but "pussley" it is on the tongue of the New England farmer, and all who work the soil will know it by that name as well as by any other, although "pursley" is another name for it.

This farmer with 160 acres sown to the despised weed declares that it is "twice over" the best crop on his farm and that if he hadn't discovered its value at a certain crisis in his career, his goods and chattels might have been distributed by the sheriff. At any rate, he is as strong for "pussley" as a Chinese mandarin is for ginseng. This is the way it came about.

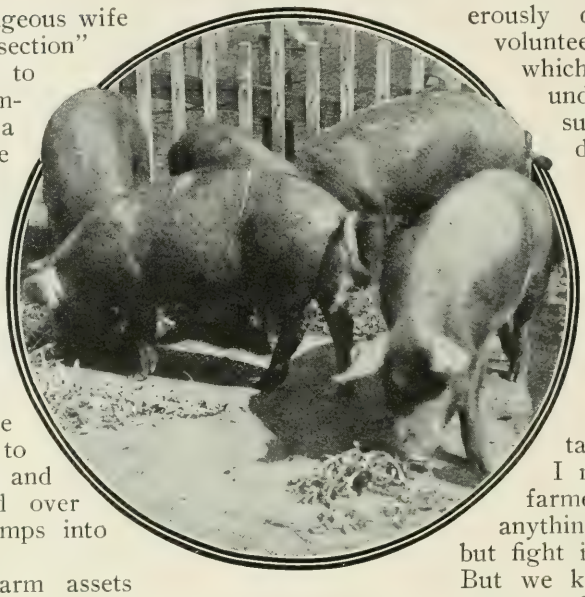
When he was working at a desk in a western city, young Marsden was seized with a revulsion against office routine and a hunger for the freer life of the farm. He wanted a job from which he couldn't be fired and a piece of ground to call his own. His wife sympathized with his ambition and encouraged him to make the change as soon as he found just the right opportunity.

His opportunity appeared in the farm of an able real estate agent who sold him a whole section of Nebraska land before his ardor cooled. As Marsden had a little capital that looked to him like the surplus and undivided profits of a national bank, he felt that he couldn't afford to take less than a section at the price. If he were going to farm at all, why not do it on a scale worth while? And he felt that, while he would undoubtedly make some mistakes, he knew quite a little about farming—for hadn't he taken many a buggy ride through the country? And hadn't he read a whole shelfful of books and bulletins on farming?



A Typical Root of Wild Pursley.

With his courageous wife he went to "the section"—that looked to them like an empire—and put up a modest little shack. All of the land that he could put under the plow was planted to corn—which made a promising growth until the latter part of the summer, when the heavens refused to give forth rain and the sun worked over time putting crimps into the leaves.



Fattening Hogs on Pursley.

Among his farm assets were a sow and a litter of young pigs and these were the objects of much anxiety on the part of the young farmer's wife. She was fearful that they would find forage too scarce to make more than a stunted growth. One day, however, she missed the music of the squealing mortgage-lifters. But they came back to the pen at nightfall. This was repeated daily. One evening the husband remarked that those pigs had taken a sudden start and were growing like weeds and that if the corn would only keep pace with the pigs he would come out a winner.

Then the wife remarked that daybreak of each morning saw the pigs making off towards the north, where they remained until nightfall.

"That's curious," he replied, "I don't see what they get off there. Tomorrow is Sunday and I'm going to follow them up and see what kind of forage they find to keep them in such fine condition."

He did follow them—and discovered that they went to a field that was generously overspread with volunteer "pussley"—which thrived lustily under the scorching sun and heat of the drouth while all cultivated crops wilted and shriveled. The pigs fattened well on this diet and the young farmer confided to his wife:

"This thing has taught me a lesson. I never heard of a farmer who ever did anything with pussley but fight it tooth and nail. But we know that it will grow good hogs and that it will thrive when the crops go down for lack of rain. Next year I'm going to have ten acres of pussley and hogs enough to eat the whole crop. If I'm not farmer enough to make a crop of corn, maybe I can get a crop of weeds. And if the pussley on the ten acres will do as much for a big drove of hogs as the scattered, volunteer patch did for old Susan and her brood of little rooters, we'll take to the weeds!"

His ten acres of pussley made a riotous showing and the drove of sows and pigs reveled in its pasturage. They were, of course, "finished off" on corn diet, but he was so well content with the result that he this year increased his pussley pasture to 160 acres and is expecting it to give results second only to alfalfa or to a heavy root crop. He considers his pussley patch not only the surest and most inexpensive crop he can grow, but he estimates that it is the most profitable crop, by about 100 per cent, grown on his section.

NEW MOBILE HOWITZER

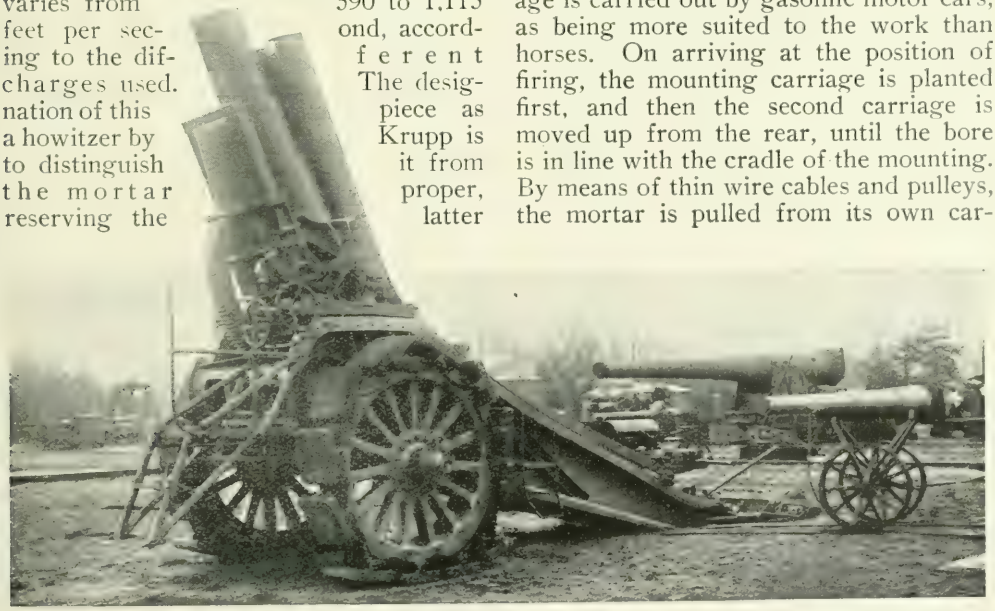
By

FRANK N. BAUSKETT

THE Krupp firm believes that in the next war between any two of the foremost nations, greater stress will be laid upon the artillery than upon any other branch of the fighting force. This is owing to the development that has taken place in the design and construction of protective works in connection with fortifications, where tremendous strength has been secured.

So the Krupp firm has invented a new type of powerful howitzer which fires a shell weighing 136 pounds, or twice the weight of the projectile used by the next most powerful weapon of this class, besides having a range 20 per cent higher. The charging of this monster field piece requires the aid of six or eight men, the explosive weighing 38 pounds. The initial velocity of the projectile varies from 590 to 1,115 feet per second, according to the different charges used. The designation of this piece as a howitzer by Krupp is to distinguish it from the mortar proper, reserving the latter title for those weapons capable of firing at an angle exceeding 45 degrees. This new invention, however, has a greater variation in its elevation than 45 degrees, so that it really is more flexible in use. In fact, the training gear of the new arm gives a maximum variation of 65 degrees, and works upon a rapid system. The weapon can also be moved 5 degrees on either side in the horizontal plane.

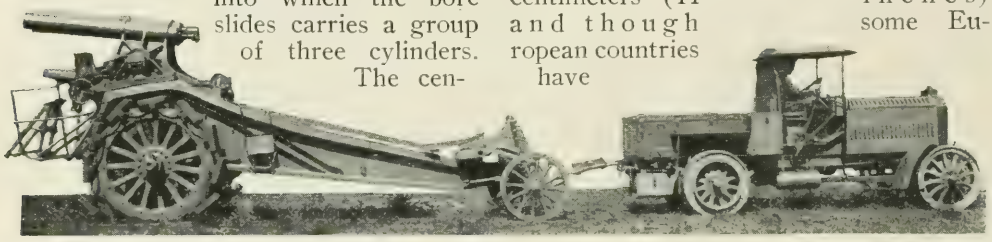
The carriage upon which the arm is mounted is composed in reality of two vehicles. The barrel, or howitzer proper, is carried upon one carriage, while the other carries the mounting with the recoil brake and the two air reservoirs. In transport, for the sake of convenience, the two pieces are hauled separately, the main wheels of each vehicle being shod with feet so as to permit passage over soft ground without sinking, while haulage is carried out by gasoline motor cars, as being more suited to the work than horses. On arriving at the position of firing, the mounting carriage is planted first, and then the second carriage is moved up from the rear, until the bore is in line with the cradle of the mounting. By means of thin wire cables and pulleys, the mortar is pulled from its own car-



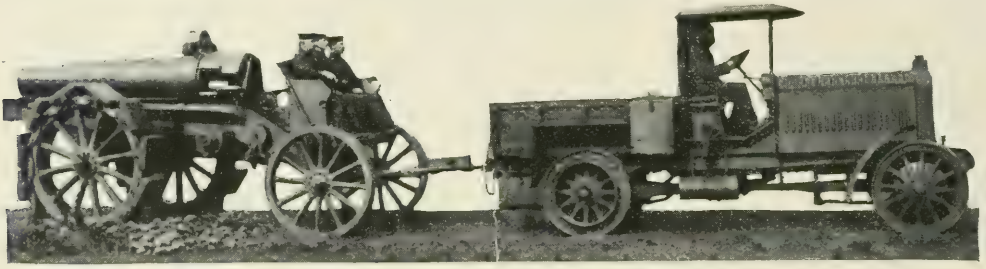
THE NEW 11-INCH KRUPP HOWITZER, DESIGNED PARTICULARLY WITH THE VIEW OF COMPETING WITH MODERN FORTIFICATIONS.

riage, and slides over special guides through the openings in the second carriage, until it is in the designed position, where it is made fast and connected up. The second carriage is then withdrawn, leaving the weapon complete upon the mounting carriage and ready for firing.

The upper part of the cradle into which the bore slides carries a group of three cylinders. The central cylinder is the recoil brake, while that on either side is an air reservoir. The recoil brake differs from that adopted in connection with field pieces. The gun is not connected to the brake cylinder but to the piston rod and the piston which moves in the recoil of the gun, the brake cylinder remaining stationary. The air reservoirs consist essentially of an air cylinder, a ram with piston rod and piston, and valves.



THE MOUNTING, THE RECOIL BRAKE, AND THE TWO AIR RESERVOIRS ARE TRANSPORTED ON A SEPARATE CARRIAGE.



THE BARREL, OR HOWITZER PROPER, IS CARRIED ON ONE CARRIAGE FOR THE SAKE OF DISTRIBUTING THE WEIGHT IN TRANSPORTATION.

The barrel of the gun is made of steel, and comprises the inner bore and a jacket, the total length being 11 feet. The opening and closing of the breech is effected by turning a handle through a horizontal arc for about 135 degrees, and there is a safety device operated by hand to prevent premature firing or the accidental opening of the breech. After the discharge, the spent cartridge is automatically ejected by the opening of the breech block. Owing to the principle of construction, the opening and closing of the breech can be effected easily by one hand and in a few seconds, notwithstanding that it weighs nearly 1,200 pounds.

This new weapon has a bore of 28 centimeters (11 inches) and though some European countries have in use weapons of a similar type, they are of a smaller bore and are in every instance practically permanent defense pieces, demanding a solid firing platform. Accordingly, if the occasion arises for the weapon to be removed from one point to another, the undertaking is one of great magnitude occupying considerable time. It was just this deficiency in mobility that caused the Krupp firm to design this new gun, the outstanding feature of which is that it is mounted upon a gun carriage so that it can be moved from point to point, and can be attached to the artillery in field operations. This end is achieved without any ballistic efficiency by the application of a long invariable recoil, and by the employment of wheels fitted after the manner of the Diplock pedrail.

RESCUED FROM A SEA OF GREASE

By

G. F. MORTON

ONE of President Roosevelt's Country Life commissioners, desiring to make a first-hand investigation of the average meal served in the average farm home when company was not anticipated, dropped in one night unexpectedly to take "pot luck" with a western farmer. You will find his report in the official proceedings of the commission, reading in this manner: "The wife fried some pork until it was brittle, fried the potatoes in the resulting grease, took the bread from the oven and put it on the table in chunks and then for dessert served crackers, diluted milk and vanilla extract, uncooked, and called it pudding."

Miss Ida Rigney, Who is Teaching Farmer's Wives How to Cook.

"The everlasting sea of grease" is the manner in which the dainty domestic economy professor on the Breakfast Bacon special of the Rock Island railroad referred to the culinary surroundings of the average farm wife in the course of every address delivered, time after time, day after day, while the special train traversed the grain belt, teaching the farmwife how to cook food so that it will be more digestible.

In this campaign to throw out the life-line to the dyspeptic farmer floundering in "the everlasting sea of grease" and rescue 33,000,000 tillers of the soil from the early grave of indigestion, the state of Kansas is entitled to the honors. No other state is going about the task so systematically or securing such good results. If the farmer persists in wallowing in the trough of half-cooked and wrongly-cooked foodstuffs, it will be his own fault and not the fault of the progressive western state which has abandoned the roller towel, discarded the individual drinking cup, compelled the landlords to put eight-foot sheets on the bed and protected the credulous investor from the glittering promises of the "blue sky" promoters.

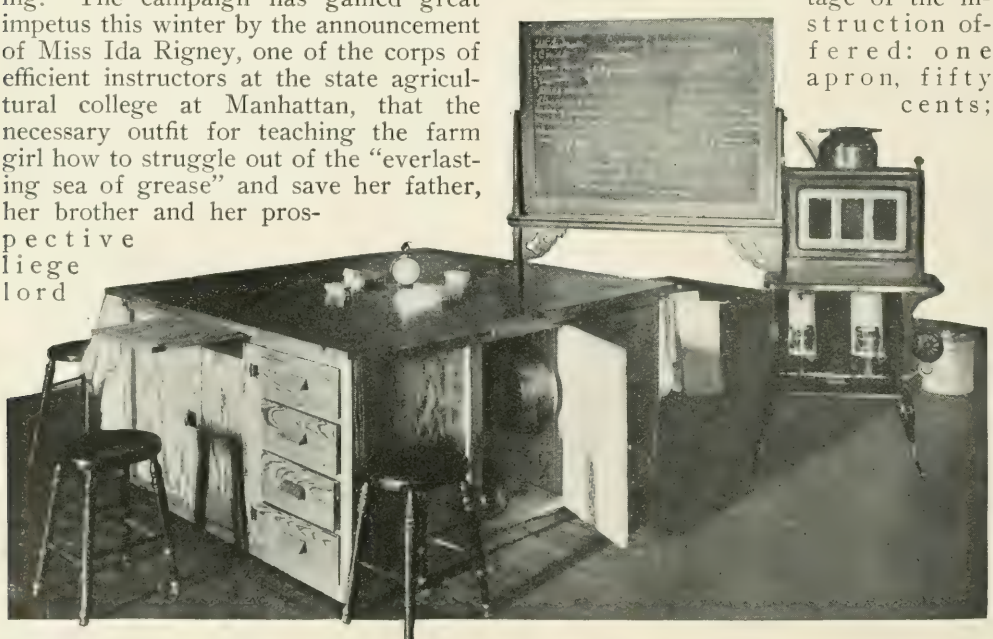
The success of the traveling cooking school has led to the inauguration of a campaign to introduce domestic economy in every rural school in Kansas. Two years ago the traveling cooking school started out on its mission, under the guidance of Miss Frances Brown of the domestic economy department of the state university, of inculcating right cooking ideas in the brains of the Kansas housewives. A week was spent at each of three towns (Osage City, Beloit and Burlington) and housewives by the dozen crowded into the room where the culinary experts gave their practical instruction in cooking and sewing. The week's work began on Monday morning and finished late Saturday afternoon, the mornings being given over to cooking lessons and the afternoons to sewing. Monday the pupils learned how to cook vegetables and make yeast; Tuesday they were instructed how to cook meats; Wednesday they had a lesson in the preparation of left-overs and a few pointers in the gentle art of purchasing; Thursday and Friday they were given courses on soup making and cake-baking; Saturday they were instructed about

salads and table setting. Farmers' wives and daughters worked alongside the bankers' family from the city and all Kansas woke to the value of the efficient work being carried on "in its midst."

Kansas justly prides itself on the fact that it is the first state in the union to make the experiment. Boston had cooking classes in its schools twenty years ago. Fifteen years ago Germany and France had organized and publicly supported instruction in cooking in many schools. For the past dozen years cooking classes have been conducted desultorily at Chautauqua Institutes. Within the past two or three years various state fairs have offered free cooking lectures among their attractions. But no state ever before organized a regular traveling cooking school to traverse the state and take practical culinary and domestic economy knowledge direct into the homes of the people without price.

Not content with this achievement, Kansas has still more recently taken up the work of supplementing the traveling cooking school by introducing domestic economy into every rural school in the state. Already between five hundred and six hundred rural schools in Kansas have added courses either in cooking or sewing. The campaign has gained great impetus this winter by the announcement of Miss Ida Rigney, one of the corps of efficient instructors at the state agricultural college at Manhattan, that the necessary outfit for teaching the farm girl how to struggle out of the "everlasting sea of grease" and save her father, her brother and her prospective liege lord from the pains and pangs of indigestion may be secured for the small sum of fifty dollars. Miss Rigney is now engaged in interesting every rural school teacher in Kansas in her scheme, which is to secure the appropriation of $50 by the school district and invest it in an outfit which includes everything from tables and a two-burner oil stove to dustpans, dishes, fruit jars and the china for serving the concoctions which the country girls are to be taught how to make. Nor does Miss Rigney stop with this; she has figured it out that for two and one-half cents a lesson for each girl this domestic science department may be maintained in one corner of the schoolroom throughout the entire year.

There is nothing skimpy about the $50 estimate, according to Miss Rigney. The work table is equipped with cupboards and drawers, the china is dainty and of attractive pattern and there is everything that the school girl would need in her own home, were she called upon to prepare the ordinary home meal for the family or even to entertain unexpectedly as high and exalted a personage as a Country Life commissioner. And for seventy cents every farm girl can buy everything that she needs to take advantage of the instruction offered: one apron, fifty cents;



MODEL EQUIPMENT FOR TEACHING COOKING IN A RURAL SCHOOL ALREADY ADOPTED IN FIVE HUNDRED SCHOOLS IN THE STATE OF KANSAS.

PUTTING INTO PRACTICE IN THE FARM HOUSE SOME OF THE PRACTICAL THINGS LEARNED IN THE RURAL COOKING SCHOOLS.

one dish towel and cloth, five cents; one hand towel, five cents; one holder, five cents; one notebook, five cents. In these piping times of agricultural prosperity, when Kansas farmers are spending the winters in California on the profits of their wheat crop, the summers in Europe on the earnings of their herds and buying automobiles, motorcycles and pianolas between times, there seems to be no good and valid reason why fifty dollars for the school district and seventy cents for the individual pupil need stand between the citizens of Kansas and perfect digestion.

The campaign thus launched is bound to gain headway and sweep the entire country. Rural America has paid all too little attention to its manner of living. Because he produced the foodstuffs of the world the farmer has paid all too little attention to how his little share of these foodstuffs were prepared and served in his own home. The old story of the farmer who, when asked what he did with all his fruit produce, answered: "We sell what we can and what we can't sell we can," has been laughed at so often that nobody has stopped to investigate how the canning operation was carried on. But at last the farmer has been roused to the realization that he is entitled to just as good and as digestible foodstuffs as the city man and that there is a rectangular shaped island of refuge in the "sea of everlasting grease" on which he may clamber and from which he may sight the promised land of perfect digestion, with all the blessings which accompany it.

SPYING BY PHONOGRAPH

SOME interesting experiments have been made at the aeroplane grounds near Paris with a special phonograph device known as roneophone for use in army scouting. Usually the aeroplane carries a pilot as well as an observing officer, who takes notes of the ground and of the enemy's movements, but it is hard for him to take notes as this prevents him from keeping up the observation of the ground while in flight. The new phonograph is designed to take

Observer in Aeroplane Talking Into the Phonograph.

down the notes which the observer dictates into it, and he is thus free. Even the pilot could do this, and a special observer would be no longer needed on board, thus giving room for carrying other material.

On board an aeroplane, piloted by Bernard, Jules Richard, the inventor, had very good success with his phonograph, and all the while that the aeroplane was flying he dictated his notes into the machine. On his alighting on the ground, the officers at headquarters were able to take the information very well and were much impressed with the performance.

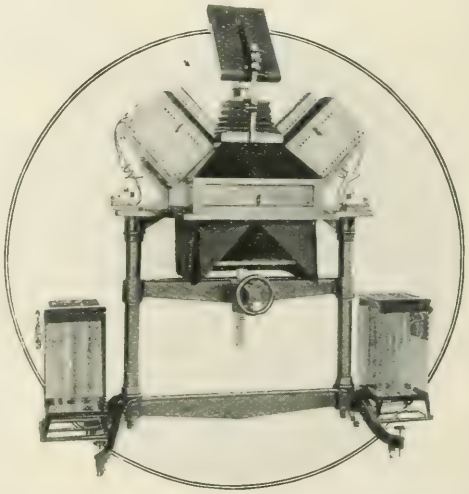
On another occasion the observer put one of the discs in a small box and dropped it at a point where it could be picked up. In this way the officers on the ground could have the details at any

Listening to the Aerial Observer's Account as Reported by the Phonograph.

desired point without requiring the aeroplane to alight and it could thus keep on its course, dropping the discs at a number of points on the field.

LANTERN PICTURES WITHOUT SLIDES

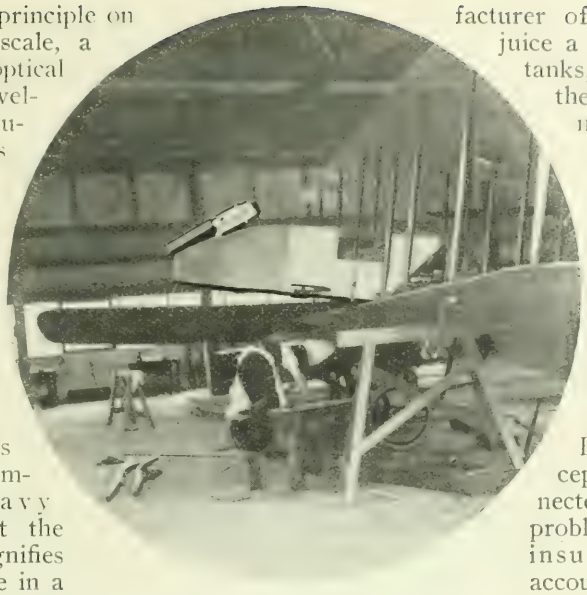
NEARLY everyone is more or less familiar with the apparatus for projecting illustrated post cards, photographs and the like which has come into quite extensive use during the past few years. By means of a powerful light focused upon the picture to be projected, the objects are reflected through a lens upon a screen in a greatly magnified form so that they give about the same effect as the pictures from lantern slides.



Instrument that Projects Large Opaque Objects on a Screen.

Applying this principle on a much larger scale, a well known optical concern has developed a new instrument which seems destined to become popular.

The table on which the object is placed is in a horizontal position as will be seen from the accompanying photograph. This makes the accommodation of heavy objects easy but the lens which magnifies the piece must be in a vertical position. The picture is righted, however, and thrown in a horizontal plane by means of a mirror just above the lens.



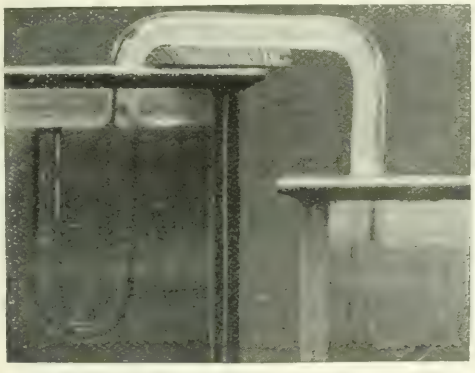
BRITISH AEROPLANE EQUIPPED WITH GUN.
The practice of thus increasing the efficiency of military flying machines seems to be becoming general.

Any object within the dimensions of the table and up to nine inches in thickness can be shown upon the screen by means of the apparatus and large drawings, magazine illustrations, posters, etc., can be shown equally well.

SELF-STARTING SIPHON

THE common form of siphon can stop action without aid and does so at the very moment when the supply of liquid is exhausted, and the level falls below the siphon entrance. That kind of siphon will not start again without suction or refilling. Consequently such a form is useless for connecting aquaria, tanks, or tubs, where water or some other liquid is to be kept flowing from one to the next. If a farmer wishes to connect a series of tubs in his barnyard, or the manufacturer of cider or grape juice a series of vats or tanks, he has to call in the plumber to connect the tubs, through the bottom, by a laborious and expensive process which, even at its best, is likely to have leaks appear or to work in an unsatisfactory way. But when the receptacles to be connected are glass, the problems seem almost insurmountable, on account of the difficulty of making water-tight connections between the glass and the pipes, whether the pipes are metal or glass.

The ordinary siphons that pass over the top of the vessels will not work well, because, if the inflow to the first receptacle is greater than the outflow through the siphon, that receptacle soon becomes too full and runs over. If the inflow is less than the outflow of the siphon, the siphon soon "gets ahead" and exhausts itself. To overcome this difficulty, a siphon has been devised that does not empty itself, but even when it ceases to act still remains filled. In other words, it waits automatically until the liquid in the first receptacle has risen as high, or higher, than that in the receptacle with which it is connected. The accompanying illustration shows the siphon and the method of connection between two glass aquaria.



THE SIPHON THAT CAN RESUME ACTION WITHOUT AID.

The new plan will, doubtless, be found useful and economical in many cases where siphons are not now in general use.

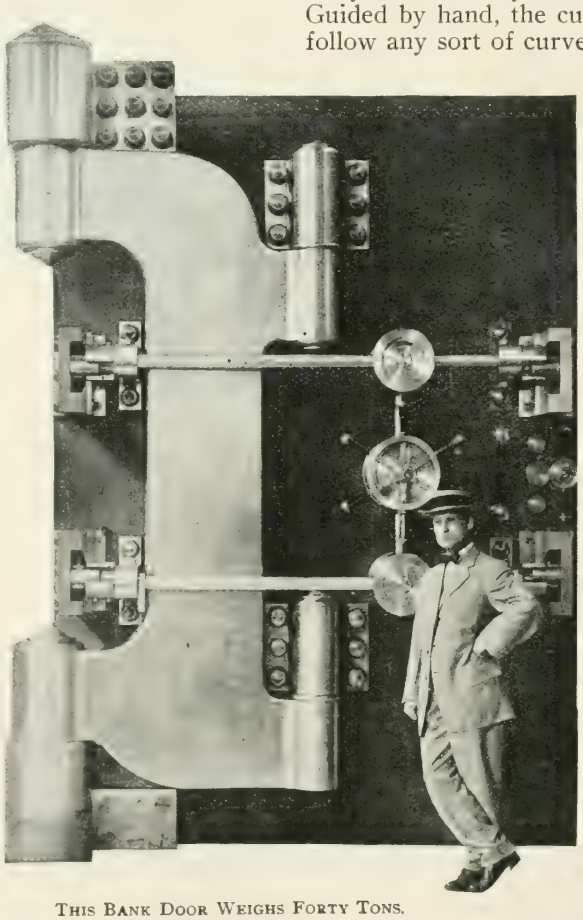
WORLD'S LARGEST TREASURE VAULT

By

P. HARVEY MIDDLETON

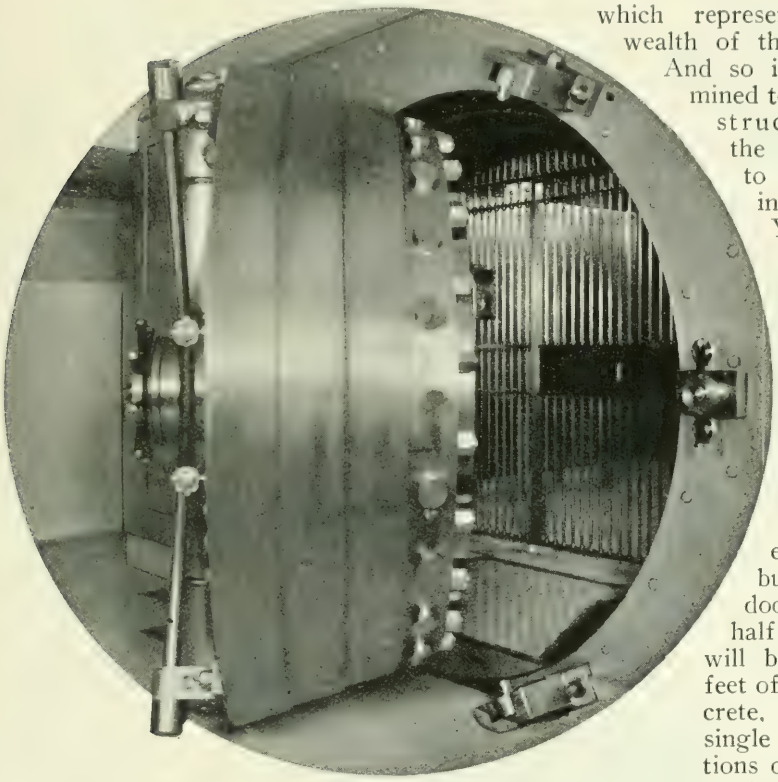
THE burglar and the anarchist have now been provided by science with a weapon of such terrible power that the gravest apprehension on the part of custodians of currency and securities all over the world is fully justified. Untold millions of gold coin and easily transportable paper currency are locked up in vaults and safes that have hitherto been considered impregnable. Today, thanks to science, the burglar, or riot leader equipped with this new device can enter the strongest armor-plate or laminated steel vault with as much ease as you or I would open a box of oranges! A vault costing $150,000, holding perhaps a million dollars in currency, with doors made of six-inch drill proof steel, can be opened by an inexperienced man armed with this new tool in three minutes.

This disquieting apparatus is the oxy-acetylene cutter burner, which cuts right through even battleship armor almost as readily as a grocer cuts cheese with a knife. It originated in Germany, where it was first used for opening plugged blast-furnace tap holes. It consists of two nozzles,—a preheating nozzle delivering mixed oxygen and hydrogen, which is used to heat the metal to the required temperature, and a second nozzle delivering pure oxygen only. Both nozzles are set close together so that both streams of gas strike the metal at the same time. This cuts the metal by oxidizing it without melting, and blows away the oxides by the force of the blast. Guided by hand, the cut can be made to follow any sort of curve. A burglar, for instance, can in three minutes cut a hole through a heavy steel vault large enough to slip his arm through, and he could then through that hole trip off the automatic devices that hold the door in place, and the wealth inside would then be at his mercy.



THIS BANK DOOR WEIGHS FORTY TONS.

The oxhydric process is based on the well-known fact that iron burns rapidly in an atmosphere of oxygen gas. "So powerful is the flame," says an expert, "that it



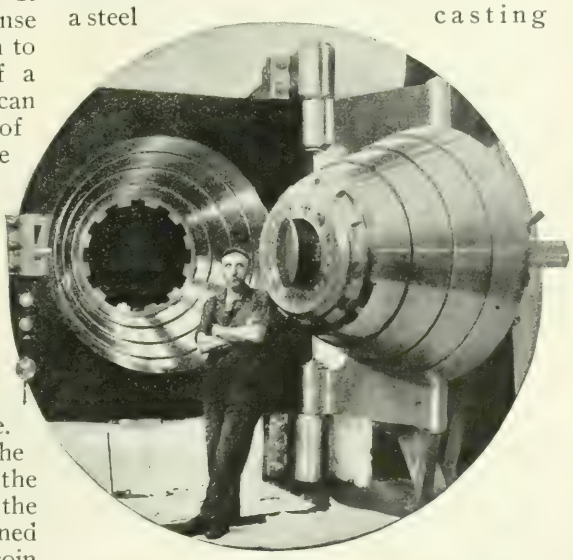
TYPE OF VAULT TO BE USED TO HOLD NATIONAL MONEYS, NOW SCATTERED OVER THE COUNTRY.
Even the oxy-acetylene cutter-burner will be able to make no impression.

which represents the nation's wealth of the precious metal. And so it has been determined to build a five-story structure underneath the new Assay Office to be erected shortly in Wall Street, New York, and to have there the largest and strongest treasure vault in the world — as befits a nation with more than twice the gold of the British Empire.

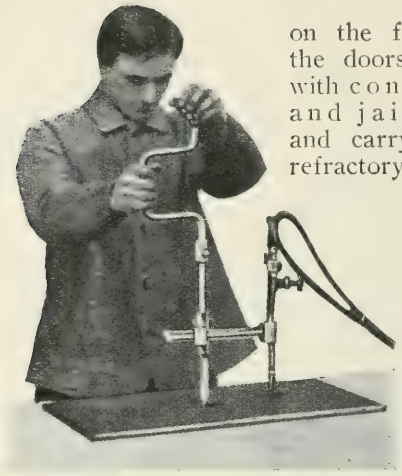
This vault will be proof against even the cutter-burner. It will have doors four feet and a half thick. The vault will be lined with two feet of the strongest concrete, reinforced with single and double sections of heavy steel railroad rails made into a complete cage. The concrete will be packed right around the rails and up against the lining, making a solid construction. There will be a steel casting

cuts through any kind of steel as a circular saw would through soft pine. It makes a clean cut, and the small intense blue flame may be likened in its action to a saw or a gouge in the hands of a carpenter." And the entire apparatus can be packed in a case about the size of those used for phonographs. The music of the cutter-burner has already been heard in European vaults. The American burglar has not yet realized its possibilities, although it is a fact than an enterprising criminal recently entered the Bank of Panama equipped with a cutter burner. There was no lining to that vault, however, and it was therefore unnecessary to use the flame.

But Uncle Sam is fully alive to the dangers of this invention (which, by the way, has many legitimate uses in the machine shop), and he has determined to protect the billion dollars in gold coin and two hundred millions of bullion



EMERGENCY DOOR ON ONE OF NEW YORK CITY'S BIG BANKS.

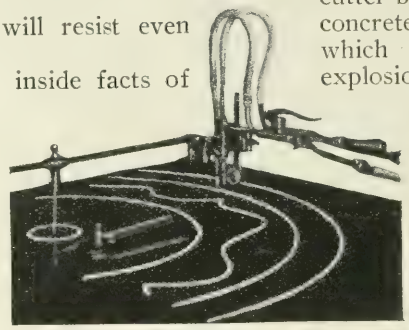


Appliance for Cutting Circles with Auger.

on the face of the doors filled with concrete and jail rods, and carrying a refractory slab of alloyed metals that will resist even the oxy-acetylene jet.

In order to get some inside facts of the present status of the art of vault building, the writer called on Mr. Frederick S. Holmes, who has designed vaults for many of the largest banks of the country. He has just finished the great vault in the Bankers Trust Building, New York, where J. Pierpont Morgan has his private offices. The entrance door of this vault weighs approximately forty tons, yet it can be swung by the use of a single finger.

"I think the one thing we are fearing more than anything else," said Mr. Holmes, "is the grave possibility of social troubles. This is fully realized by the large banks and trust companies, for it might mean that technically equipped men, either of their own free will, protected by a large mob, or acting under the compulsion of the leaders of that mob, would use the cutter burner against a bank vault. Ninety-five per cent of the vaults of the country could be opened in a very few minutes in this way, and the spoil divided. The oxy-acetylene jet in the hands of the leaders of a bread riot, for instance, would speedily give entrance to all except the very latest type of vault.

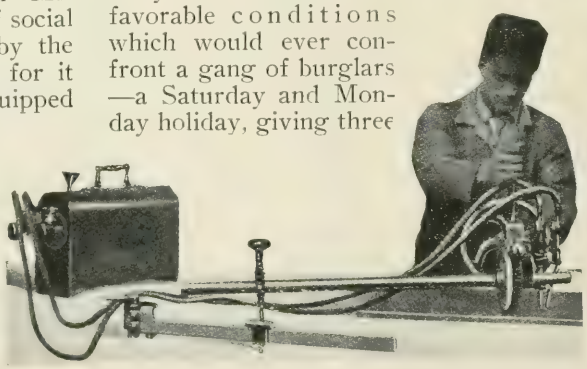


A Machine Cutting Regular and Irregular Curves.

"Whatever a man puts together a man can take apart if you give him time enough," added the vault engineer. "We know that anything we build can be opened in time. It is time that we are fighting for. The steel vault was a poser for the cracksman until the oxy-acetylene jet came on the scene, and that has destroyed all that engineering talent had done for the security of valuables up to its advent. Knowing full well that there is no steel wall of practicable thickness that can resist this flame, we have combined steel with concrete.

"With walls of concrete and steel a vault is safe from all quick work. The cutter-burner is baffled by the concrete, and the steel rails which reinforce it prevent an explosion, and render the sledge-hammer and cold chisel ineffective. The walls of such a vault could only be penetrated by alternate attacks with the cold chisel and oxy-acetylene jets. Enough explosive to crack the vault would bring the building down. The cracksman would have to chisel away the concrete bit by bit. His burner would eat away the steel, but there would remain more concrete and more steel.

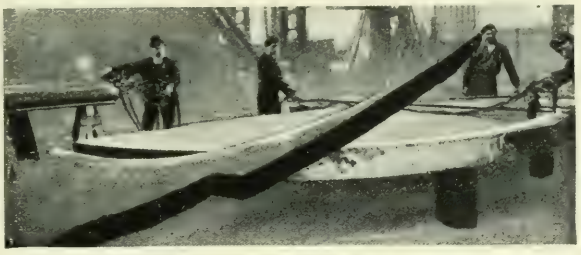
"Boring through by such a process would not only be time-consuming but noisy. Take the most favorable conditions which would ever confront a gang of burglars—a Saturday and Monday holiday, giving three



Machine for Regular or Irregular Circular Cutting.

days for work. This would, of course, presume that the watchmen were either accomplices of the gang or were murdered. Working in shifts continuously, and leaving out of consideration the additional protection of the electrical signal devices in the safe wall, and the certainty of interruption from outside, the cracksmen could not with their best efforts get through to the valuables in the three days' time."

The vaults of the Bankers Trust Company—the tallest banking building in the world — give one a good idea of what the new Assay Office treasure room will be like. It is the strongest vault in the world at the present time. Its walls are twenty-eight inches in thickness, built up of four inches of shock and drill proof steel, surrounded with two feet of rock concrete, and two rows of heavy steel rails, and further reinforced with massive beam work. The enormously heavy columns and beams of the frame of the building are built into, through, and around these vault walls, and the entire mass is so tied together that a shock sufficient to disturb the vault would bring the building down in ruins on top of it.



MODERN VAULTS ARE NOT PROOF AGAINST THE BURNER-CUTTER.
A nine-inch nickel chrome-steel armor plate after one-half the circle has been cut.

The forty-ton entrance door, already referred to, is three feet in thickness, and is of composite construction, the outer half being formed of a steel casting containing concrete and interlaced refractory steel members, the inner half being built of two-inch five-ply chrome steel plates, low steel sections, and a solid cast bolt frame. All the locking mechanism is covered with steel plates upon the inside, obviating an almost universally weak condition in most of the existing vaults, where a small hole through the vault walls provides direct access to the locking connections.

In a vault so large and with so many aisles there is always a chance that someone may be locked in at night. To avoid this danger as far as possible not only is the vault inspected before closing, but an alarm gong is automatically rung by the closing of one door and continues ringing for several minutes until the second door is locked. If, notwithstanding these precautions, an accident should occur, the person locked in would find two lamps burning. There is also a telephone inside the vault with a direct line to "Central." Then there are call bells for messengers, and riot alarms. All the entrances to the vault are protected on the outside by a mob-proof enclosure.

If further proof were needed of the urgent necessity for the eyes of bankers and others to be opened to the need of radical reform in the construction of vaults and safes, it is to be found in the latest report of the American Bankers' Association, which contains the information that from September 1909 to September 1912, bank burglars secured without any great difficulty the neat sum of $1,719,510. "The above figures do not accurately represent the number of attacks upon banks," says the report, "nor do they give the accurate losses sustained by such banks as the result of the depredations enumerated. These statistics are necessarily incomplete because of the difficulty encountered in gaining information from the banks in question."

And the bare money loss does not constitute the whole debit account, since, as is obvious, considerable property is destroyed in such raids. Costly vaults are frequently damaged beyond repair, massive safes are reduced to pitiful scrap iron, and expensive office furniture and fixtures are totally wrecked.

One of the best specimens of the latest type of vault construction is that of the Chemical National Bank in New York, where the famous Hetty Green for so many years had desk room. This vault is forty feet below the level of the street,

the foundation walls being of masonry and concrete. In the vault itself the strong room rests on a number of concrete piers. A narrow passage runs right through the sides, and by an ingenious arrangement of mirrors the watchman passing along the gangway in front can see every part of the back and sides, as well as the open niches under the safe. The strong room itself weighs three hundred tons, the walls being composed of five layers of steel. The outer door—for there are two—has a weight of six tons.

A novel feature in connection with this vault is, that steam pipes run along the passages and, in case of an attack upon the bank, jets of steam can be made to play upon the strong room, terribly scalding the burglars. Cardinal Gibbons was recently shown over this vault and, after a careful inspection, turned gravely to his guide and summed up his conclusions in a paraphrase—

"Man's inhumanity to man
Makes countless burglars mourn."

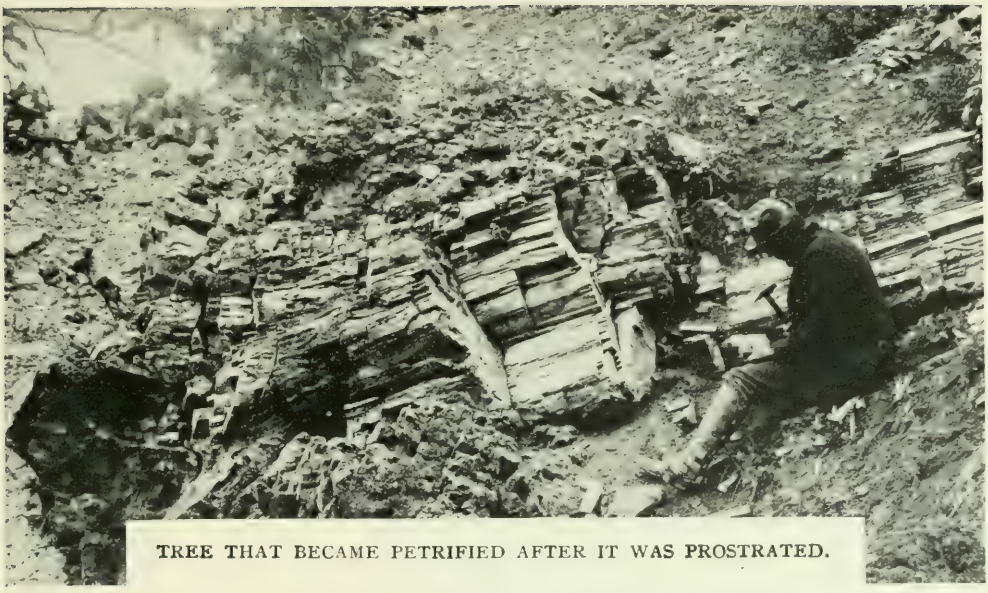
Another remarkable device used in the same vault for contributing to the discomfort of a criminal is the tell-tale disguised tinfoil curtain with which electrical wires are connected from the superintendent's room in the upper part of the building. The mere pressure of a man's body upon the wall of the strong room during unusual hours will set bells of startling loudness ringing.

Thalassa! Thalassa!

I stand upon the summit of my life,
Behind, the camp, the court, the field, the grove,
The battle, and the burden: vast, afar
Beyond these weary ways, behold, the Sea!
The sea, o'erswept by clouds, and winds, and wings;
By thoughts and wishes manifold; whose breath
Is freshness, and whose mighty pulse is peace.

Palter no question of the horizon dim—
Cut loose the bark! Such voyage itself is rest;
Majestic motion, unimpeded scope,
A widening heaven, a current without care,
Eternity! Deliverance, promise, course,
Time tired souls salute thee from the shore.

—*Brownlee Brown.*



TREE THAT BECAME PETRIFIED AFTER IT WAS PROSTRATED.

FIFTEEN FORESTS ON ONE SPOT

By

GUY E. MITCHELL

THE little known fossil or petrified forests of the Yellowstone National Park are the most remarkable of their kind in the world. Isolated pieces or stumps of petrified wood are of common occurrence, being found in almost all quarters of the globe, from far northern points of Arctic exploration expeditions to southern South America. In many localities there are aggregations of logs and stumps that are worthy to be dignified by the name of petrified forests; as, for example, the famous "Petrified Forest" of Arizona; a "forest" near Calistoga, California, and one in the vicinity of Cairo, Egypt. But in these places all or most of the trunks are prostrated and lie broken and scattered about in the greatest confusion. In some cases there is evidence that the logs were transported by currents before being fossilized or petrified. The petrified forests of the Yellowstone National Park, on the other hand, are not only much more extensive in area, but the trees stand upright in the exact positions in which they grew originally. Many of these trunks, standing on the slopes and steeper hillsides, rise to a height of twenty to thirty feet, and are covered with lichens, and blackened and discolored by frost and rain. They are thousands, even millions of years old and of solid stone.

The forests of standing trees are all found in the vicinity of the Lamar River, the most striking being on the slopes and cliffs of Amethyst Mountain. Nearly all of these forests are easily accessible from the well-traveled road between the Mammoth Hot Springs and the town of Cooke, Montana.

One of the forests, near Yancey's, is known as Yancey's Fossil Forest. It is reached by an easy trail, and as one approaches a number of trunks are observed standing upright among the stumps and trunks of living trees, and so

The Fossil Stump of a Great Sejuria, Ten Feet in Diameter.

much resembling them that a near view is necessary to convince the visitor that they are really petrified trunks. Only two rise to a considerable height above the surface. The larger one is about fifteen feet high and thirteen feet in circumference; the other is a little smaller. The roots are not exposed, so that it is impossible to determine the position of the part in view, or its original height. Close at hand are the standing trunks of many others, but the disintegrating forces of nature keep them at about the same level as that of the surrounding rock. Some of these trunks rise only a few inches, while others are nearly covered by earth and debris. They vary in size from one to four feet in diameter, and are so perfectly preserved that the annual rings can be easily counted.

In the fossil forest on the northern slope of Amethyst Mountain the trunks stand upright considerably above ground, but the most stupefying fact is that there is a succession of these forests, one above the other, through the entire two thousand feet of the mountain, fifteen separate and distinct forests in all. The assumption is that in ancient times a magnificent growth of trees flourished throughout this region. This was buried under the ashes and other debris ejected from the volcanoes which at this time were in tremendous eruption. The trees were then surrounded by silica-charged waters and were turned to stone. After the first forest was entombed, quiet was restored for a sufficient length of time for the volcanic material to be reduced to soil, and a second forest to grow. Possibly the roots of this forest entwined amongst the topmost branches of the original forest. Then volcanic activity was renewed, and the second forest was buried and silicified as the first had been. These tremendous processes were repeated until two thousand feet of volcanic material had been distributed by the volcanoes and not fewer than fifteen forests were entombed. Then the volcanoes ceased their activity, final quiet was restored, and the growing forests of today appeared. The disintegrating action of frost and rain immediately set in and has carved out this mountain, in which may be read the story of its origin.

ONE BUILDING INSIDE OF ANOTHER

A SEVENTEEN story warehouse was erected on three sides and over a small building recently in Chicago. While the steel and brick structure, costing a million dollars, was being erected for the use of a general merchandise company, a snag appeared in the procedure when the occupant of the small one-story building shown in the illustration refused to move out. This occupant holds a lease on the property. The lease has still three years to run. The builders have offered $6,000 for the lease, but he has refused to accept that sum. And, as there is no question about the validity of his lease, the big merchandise establishment has been compelled to go to an additional cost of $26,000.

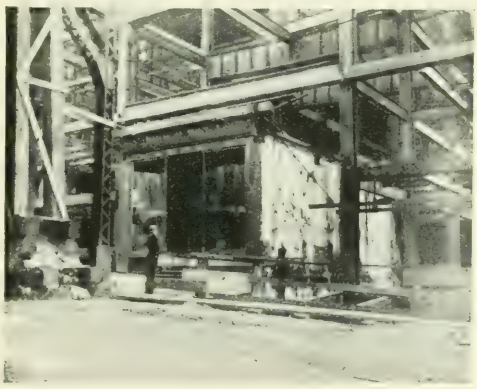
CARRYING COAL BY PIPE LINE.

CARRYING COAL BY PIPE LINE

THE proposal to pipe a mixture of pulverized coal and water, as oil is now piped, is not new; but it has been limited to the coal dust produced in ordinary processes of mining and often washed. It has never been carried out industrially, at least on any considerable scale. But now two New York inventors propose to mine all coal in the form of dust, with a specially constructed machine, mixing it at once with water and handling it thereafter by pumping through pipes. At its destination it will be separated from the water and dried and can then be used for all, or almost all, the purposes for which lump coal is now employed.

The inventors claim that this coal-mining machine not only cuts the coal from floor to roof into a finely powdered state, but pipes it, mixed with water in the mine, to any distance desired, as, for instance, to the coal washer or coal bins adjacent to the coke ovens. It necessarily does away with the use of explosives, and as the mine is always wet and washed clean, there is never any coal dust. The system is a peculiarly safe one to use in gaseous mines on this account.

The machine itself is automatic, advancing by a simple hydraulic feed mechanism which propels it along the floor into the face of the seam. A fire-engine hose leading from some source of water under pressure enables a powerful stream of water to be thrown against the face of the coal while it is being cut, thus eliminating all dust and keeping the tools cold. The water carries away with it the pulverized product.



ONE BUILDING INSIDE OF ANOTHER.

KEEPING FRUIT TREE BUDS ON ICE

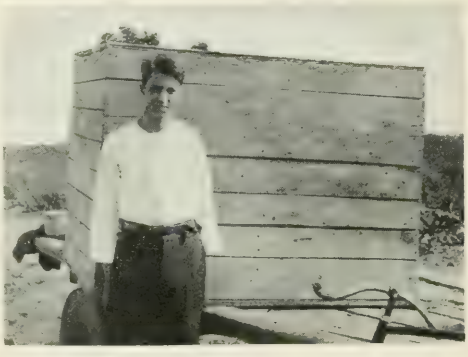
ONE man has gone a step farther than the cold storage of fruit. He is storing at low temperatures the buds used to produce the fruit trees them-

selves. This man is manager of a big nursery at Berlin, Maryland. The plan was hit upon by his son, a student taking a course in horticulture in Cornell University.

Most fruit trees now are budded. In simple terms, this is the introduction of a bud from a desirable tree in the bark of a little seedling tree, so it will grow fast to the cambrium, or growing layer, of the seedling, and live. The main stem of the seedling is then cut off, and the shoot from the bud forms the tree. This method is used now largely in most nurseries, instead of the old plan of grafting. Several million trees are budded every year in the nursery at Berlin.

Has Ridden 140,000 Miles on His Wheel.

When buds are kept for even a short time after they are cut from a tree, they dry out, if the atmosphere is at all hot or dry. Budding is always done in the summer, when these are common conditions. Buds that are hot and somewhat wilted do not unite readily with seedlings, and the percentage of loss in budding is high. The young man decided the proper plan was to keep the buds in a dormant condition until used. So he built a special ice box which is mounted on a wagon and may be taken to the fields. The buds are kept in the ice box for at least five hours, to take away the heat. They may be kept thus for several days. When taken out, the buds are in condition to unite with the growing wood of the young seedlings.



Ice Box for Keeping Tree Buds.

HAS RIDDEN 140,000 MILES

EIGHTY-FOUR years old and a bicycle mileage of 140,000 is Thomas W. Davis' record. Davis was sixty years old before he rode a wheel. He began with the old-fashioned "ordinary," one big wheel and a diminutive trailer, but he cast it aside when the "safety" came along.

Davis took up cycling at an age when most men relinquish strenuous things. Since then there has seldom been a day, weather conditions permitting, that he has not taken a ride, and in many of these years he has ridden between 6,000 and 12,000 miles. Even now he is doing 3,000 to 4,000 miles each year. He has participated in endurance contests in this country and in Europe. In one of his best years he rode eighteen "centuries." He has a trunk full of medals. In his twenty-four years as a wheelman he has worn out eleven machines.

It was between his sixtieth and seventieth year that he reeled off his largest mileage. In 1906 he rode 12,465 miles, his greatest mileage record. Between 1896 and 1900 he rode 55,000 miles. Since then his annual mileage has declined, he having thought it best to drop the strenuous pace of his earlier years.

Over the grave of his wife who died ten years ago is a monument which Mr. Davis designed to answer for both. On this shaft is chiselled a figure of a bicycle.

BARGE WITH STEEL BUCKETS, WITH DERRICK ABOVE.
The coal is hoisted into separating screens on land.

PLACER MINING OF COAL

By

GEORGE H. CUSHING

IT was in 1892 that the Reading Railroad failed and as a result J. P. Morgan was introduced into its management. Following as a consequence the anthracite coal industry, several year later, was brought under railroad control. Then, as effect flowing from cause, the new masters applied packing house methods and began to save and to sell the waste products.

Before this systematizing of anthracite production, as much as twenty per cent of the anthracite coal has been thrown away because nobody believed it was worth anything. That is, the people had not then learned—a thing they are coming to understand now—that the best combustion results are obtained with the small sizes of coal. For that reason, the coal which we call chestnut, pea, rice, and buckwheat was dumped, along with the slate and stone, upon the ground in great piles. This mixture of coal and stones was called a culm pile.

In the anthracite field, these culm piles have had a fantastic record. Many of them have caught fire and a few of them, at night, have given off a phosphorescent glow which might be seen for miles and appeared on the horizon like some giant firefly. In some of the others, the center has burned out enveloping the landscape in smoke; the crust left undisturbed has given way when men have tried to walk over it. Some of these culm piles, built on the banks of the Susquehanna and Schuylkill rivers, have avalanched great portions of themselves into the streams when the floods came. For a long time, the owners of these culm piles thought nothing of these many subtractions from the original bulk but rather thanked a benign providence for thus clearing their ground that they might have room in which to store more waste of the same kind.

The great strike of the anthracite miners in 1902 brought a sudden end to

THE COAL IS HOISTED AND WASHED BY THE DREDGE AND LOADED WITH STEEL BUCKETS ON A SMALL BARGE, READY TO BE TAKEN ASHORE.

this orgy of waste. The people wanted anthracite but it was not being produced. Some genius thought of that coal going to waste in the culm piles and then the "anthracite trust" began to build "washers," the function of which was to separate that fine coal from the wealth of slate and stone by which it was surrounded. This salvage work on the old culm piles has now gone so far that last summer, although there is no mine in that vicinity, a washer was built at Hawley, Pennsylvania. Fifty years ago, a gravity railroad was built between Pittston and Hawley; this was graded with that culm. After having lain there unused for more than a generation, this old roadbed is now being dug up and put through a washer that the coal which it contains may be reclaimed.

Also, the 1902 strike brought another development. A band of desperately poor men living along the banks of the Susquehanna and Schuylkill rivers needed coal which they could not buy. They knew that great sections of the culm piles had been washed away and they argued that the coal must be lodged somewhere in those rivers. So, they went to the streams and searched above the shallows and sand bars, where the coal was likely to find lodgement. There they found their supply. This crude beginning was the foundation of a business which now has grown into formal proportions. In fact it has reached the dignity of being attacked in the court.

The origin of these coal deposits is not hard to understand. When the culm piles, from time to time, avalanched portions of themselves into the floods, the coal was mixed with slate and stone. The coal being lighter than either of these kept afloat longer. Thus, in the river, the coal was separated from the "impurities" precisely as that same work is done in the expensive washers of the big companies. The current, running strong in the channels, carried the coal down stream until it struck against a sand bar, a ledge of rock, or some other obstruction. There it lodged and by adding to the obstruction in the river helped to catch other coal as it came down year after year in the same old way. The result has been that great banks of this small sized but perfectly clean coal have piled up in the shallows of these rivers. It was from these pockets of this coal that the poor men found what they needed and carried it home, telling their neighbors about it.

The discovery of so much good coal in the bed of a public stream attracted the attention of enterprising business men of Harrisburg, Reading and other cities; if anthracite coal could be had in quantity without buying land, sinking shafts and

SCREENS WHERE THE RIVER PRODUCT IS SEPARATED INTO THE SEVERAL SIZES.

building "breakers," they wanted it. Thus it came about that companies were incorporated for the purpose of engaging in placer mining of anthracite coal. These companies now maintain regular establishments and selling organizations. A few of them have reached the dignity of government, city and big hotel contracts.

The one piece of equipment requisite to such a trade is a dipper dredge floated upon a flat bottomed scow of light draft. The coal picked up by this dredge is deposited in steel buckets which are carried on other flat-bottomed scows. When the harvest of coal has filled all the barges of the fleet, they are towed to points on the shore where regular docks have been constructed. On these docks are derricks which lift the buckets of coal ashore and dump the coal upon some sort of a conveying apparatus—a moving belt or the cars of a small industrial railway. The conveyor takes the coal to a small washer where the sand is taken out. After that, the cleaned coal is passed over a set of screens and carefully sized. Then it is ready for the market.

One of these companies has a dock one mile south of Auburn, Pennsylvania, which reclaims 150,000 tons of this coal per year. This coal has been selling at $1.05 a ton on the dock, which is twenty cents a ton higher than is charged by the "anthracite trust" for the fresh mined product of the same size. The higher price is paid for the river coal because it has no slate or bone mixed with it. In view of the fact that the plants cost practically nothing and that they are operated by the most unskilled, hence the cheapest of labor, this price yields a big profit to the companies.

It has been estimated, by those who seem to know, that these two rivers contain several million tons of this coal. A year ago there was some talk that the companies in the "anthracite trust" intended to sue these river companies, claiming the coal as their own since it had been washed down from their culm piles. The river companies asked the larger concerns by what mark they proposed to identify their product. This pertinent question seems to have put an end to that matter.

Companies organized to reclaim this coal are steadily increasing in number and size. Those located on the Susquehanna River dot the banks from Harrisburg to Sunbury and are more numerous; not so many plants are on the Schuylkill River, but such as are there are larger. To give an idea of the extent of this traffic, it might be said that two companies operate at Landingville; six at Auburn; and two each at Port Clinton and Stouds Landing.

While the business cannot possibly last for any great length of time, it is attracting new recruits each year. More deposits are being found and worked.

CHARLES ELMER O'TOOLE, THE FIRST WINNER OF A STATE WIDE BABIES' HEALTH CONTEST.

JAMES HOWE ROBINSON, ANOTHER LITLLE PRIZE WINNER.

PIGS IS PIGS BUT BABIES—

By

M. G. FRANKLIN

THE state which leads the nation in hogs is last in babies. Producing practically twice as many swine as any other state, it was the only one to show a decline in human population in the last ten years.

One morning this State was jolted into taking stock of the situation. Suppose a single one of its eight million hogs took sick; forthwith there was a posthaste call for help and medical men ran to the bedside of the stricken hog, administered drugs and cared for it at public expense. If the pain grew worse, learned scientists were summoned from Washington and a terrible hue and cry was raised: "An Iowa hog is sick, what will become of the United States and its much vaunted agricultural prosperity?" But suppose one of its half million babies took sick; it was nobody's business but the parents, poor and helpless though they might be; only when the child's mother and father died, the state magnanimously stepped in and herded the little waif into a drove at the orphans' home, forthwith forgetting all about it. The great State which showed its farmers, at big expense, how to bring up their pigs, did practically nothing to show its parents how to bring up their babies.

It was high time somebody jolted this great and rich State, Iowa, for its carelessness. When the jolt finally came,

however, it was administered by a little woman so quiet voiced and mild mannered it seemed impossible her protest could carry throughout the State. That it has been heard not only in all parts of Iowa, but in all parts of the United States, is now evident to all.

"One day, two years ago I attended our county fair," says the little woman to whom credit is due, Mrs. Mary T. Watts of Audubon, Iowa, telling how the idea first came to her. "I stood at the booth of which I was supervisor, listening to the talk that drifted in, in snatches, of prizes won on hogs and horses, sheep and cattle and poultry; the same talk I had been hearing at every fair for ten years. Suddenly I became conscious of how often I had heard this talk about the wonderful improvement that really had been made in the conditions of live stock in that length of time. Just at this minute a woman with a fretful baby in her arms stopped near me to rest. A child of three clung to the mother's skirt with one hand and with the other fed herself a large, underripe banana. Three more brothers and sisters, old enough to care for themselves a little, clambered about, in imminent peril of broken necks or trampled toes. One might label the picture, I thought, an average American family on a holiday. As I looked at these children, I saw myself and brothers and sisters forty years ago, no better, no worse. Measles, whooping cough and mumps would be a part of those children's upbringing, just as they had been of mine. If they lived through these 'necessary' evils, without too great depletion of vitality, and if dread diseases did not take them off, they might grow to manhood and womanhood. Then I began to calculate that this family would probably make five new families of the same kind, possibly with less endurance.

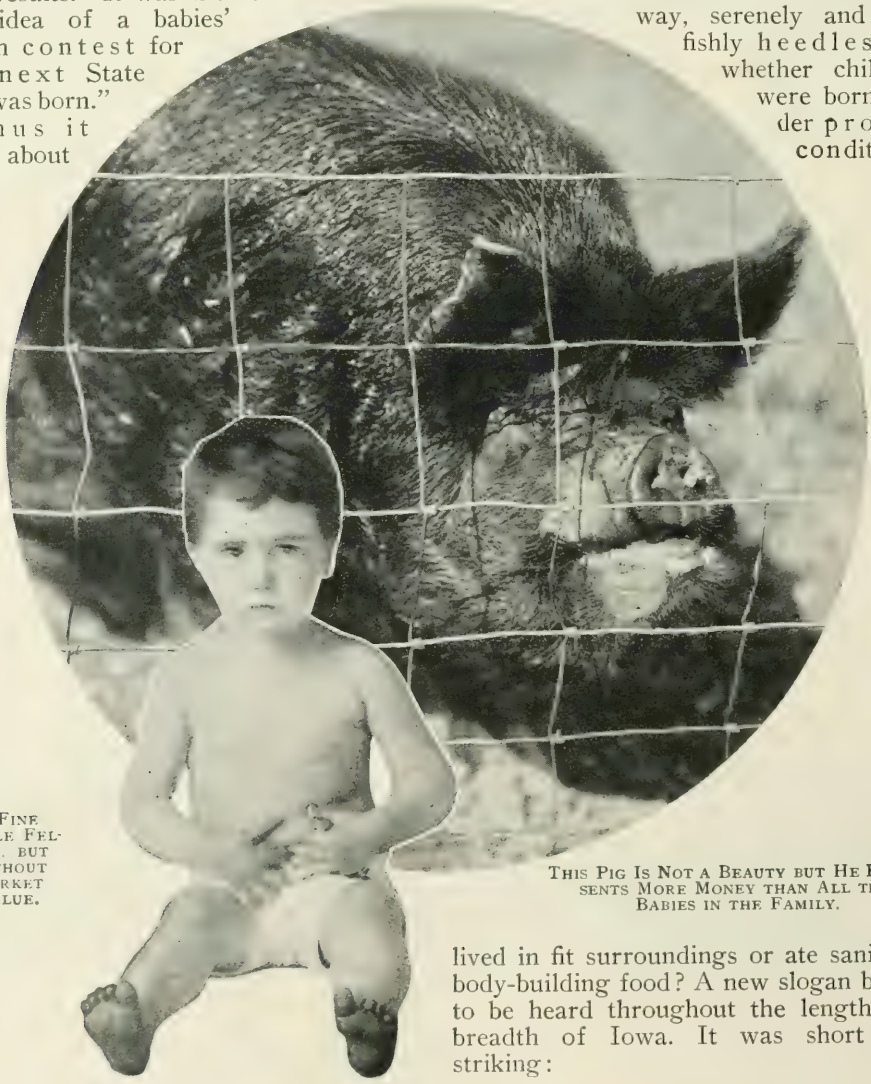
"A friend interrupted the trend of my

WORTH SAVING FULLY AS MUCH AS ANY PIG.

THE SMILE THAT WON'T COME OFF THE FARMER'S FACE WHEN THERE'S A FAT GROWING HOG AROUND.

thought to invite me to go to the stock barns with her, where the premiums had just been awarded. The man in charge of the horse barns showed his beautiful animals, sleek and shining, with glowing pride. Blue ribbons and red ribbons showed bravely on many head stalls. Every animal in the clean, well ordered cattle and hog pens had been fed and groomed with the utmost care. A man pointed with pride to a pen of hogs and told us that they had been watched almost night and day; the water they drank had been analyzed, their food measured and weighed, and only the kinds given them that would bring certain results. It was then that the idea of a babies' health contest for our next State fair was born."

Thus it came about that Iowa began to take interest in babies as well as pigs. Spurred into activity by Mrs. Watts and her associates, men and women began to wonder if human beings weren't worth while. The more they thought the more uncomfortable they became. The Federal department of agriculture had two thousand experts who journeyed back and forth over the country, week after week, going anywhere that a hog had the cholera. If the whole country were roused into activity by the fear that our whole framework of prosperity were about to topple over because the hog cholera had broken out on some farm, why was it that millions of men and women went their way, serenely and selfishly heedless of whether children were born under proper conditions, lived in fit surroundings or ate sanitary, body-building food? A new slogan began to be heard throughout the length and breadth of Iowa. It was short and striking:



A Fine Little Fellow, but without Market Value.

This Pig Is Not a Beauty but He Represents More Money than All the Babies in the Family.

MRS. MARY T. WATTS.
She inaugurated the idea of a babies' health contest.

"If a hog is worth saving, why not a baby?"

That is how it came about that the honor of being the first State in the country to conduct a baby's health contest, to pay as much attention to the rearing of children as to the breeding of live stock, belongs to Iowa. Under the supervision of Mrs. Watts the first Statewide contest was held at the 1911 Iowa State Fair. It was eminently successful, a little two-and-a-half-year-old boy, Charles Elmer O'Toole, being pronounced the nearest perfect of all the youngsters entered. It was not until 1912, however, that the Statewide campaign began in earnest, or that other States began to fall into line, emulating this new Iowa idea. Last fall, the Iowa State Board of Agriculture hung up $500 in cash prizes, with honor ribbons, to be contested for by babies, the same as it had been hanging up thousands of dollars for fifty years to be contested for by Berkshire and Chester white hogs, by Percheron and Shire horses, by Hereford and Holstein cows. At last, babies were put on a par with live stock.

DR. LENNA T. MEANES.
One of the judges at the Iowa contest.

It was a busy scene at the babies' health contest tents at Des Moines last August. Somehow the interest in the stock pens wasn't lessened perceptibly, and yet everybody agreed that the babies' tent was the most interesting place on the grounds, 60 acres of farm machinery exhibits and uncounted hundreds of pens of live stock notwithstanding. In the babies' tent were 263 of the finest little lads and lassies the great State of Iowa ever produced, running about, part of the time just as Nature had originally adorned them (with all the innocence of childhood), and a half dozen or more friendly and skillful women doctors feeling of heads, peering down throats to see if there were any evidences of enlarged tonsils, deftly swinging the calipers around little heads abloom with brown or golden tresses, and laying little forms down on ironing-board affairs to see just how long they were, or boosting them upon scales to see how heavy they were, or holding bright colored toys

PROUD OF BOTH BOY AND HOG—BUT THE HOG CAN BE MADE TO PAY QUICKLY.

before them to see how mentally alert they were. And all the time, over in an adjoining room of the big tent or peering through the netting from the outside, were fond mothers and proud fathers and a crowd of spectators—even old maids and baby-hating bachelors—vowing that their children were the prettiest or the healthiest or betting the price of a cigar or a soda water upon some unknown youngster, who was "just too cute for anything."

It was no small task, sorting and judging 263 youngsters, and the public forgot sometimes that it was health and not looks which counted. But the fourth day of the fair found the work completed and the title of "the world's healthiest baby" awarded to a two-and-one-half-year-old girl, Dorothy Klusmeyer, who stood about 36½ inches in her stocking feet, measured 20 inches around the head, had a chest measurement of 21 inches and tipped the scales at 32½ pounds; with the "runner up" a two-and-a-half-year-old boy, from the country, weighing 32 pounds, head measurement 19 inches, chest measurement 20¼ inches, and height 37 inches. Now, according to the dictum of the American Medical Association, under whose direction the contests are held, the ideal figures are these: weight, 31 pounds; height, 35 inches; chest, 20 inches; head, 19¼ inches. Accordingly, little Miss Dorothy was given a score of 97⅛ and handed a blue ribbon and fifty dollars into the bargain. And as it happened that the first contest gave the world's championship to a boy, and the second gave it to a girl, the sexes are slated for a knock-down-and-drag-out contest at the 1913 fair, which shall definitely and for all time determine the superiority of the sexes.

In the meantime the good work is going on. One of the prize winners at Des Moines last August—winning first honors for rural babies—was a husky little fellow who had been entered at the first contest the year before and had not come anywhere near the prizes. The examining physicians pointed out his defects to his mother and gave her some advice on the proper care and training of children. She went back to her country home, put this advice into active daily operation and brought her young hopeful back a year later, to win out handily in his class and prove the efficiency of the expert advice freely given and faithfully followed.

But the good work did not stop with Iowa. Oregon and Missouri were quick to see the value of the idea and held their first baby health contests, as regular features of their state fairs, last fall. Later on, Colorado fell into line and at the big cattle show this winter one of the most popular departments was that in which youngsters from the Rocky Mountain states vied for blue, red, and white ribbons just as seriously and momentously as the sleek and expensive cows and horses and hogs. And for fear the idea might not get down as close to the people as it must, if it is to succeed beyond all question, contests are now being held, or planned, for various counties of the various states, the county prize winners to enter a grand sweepstakes statewide contest, with a national sweepstakes contest planned for the

MRS. MARY WATTS MEASURING A LITTLE SIOUX INDIAN BABY ENTERED IN ONE OF THE COUNTY CONTESTS.

grand finale, just as prize winning cattle from the various State fairs go into the big International show at Chicago every winter. Which proves pretty conclusively that the long deferred awakening has come at last and that, after long years of waiting babies are considered about as well worth having and keeping as pigs and horses and cows.

There is an advantage in holding a contest of this sort. It stimulates the competitive or gaming instinct. Mothers do not like to feel that the parents of little Katie Smith next door or Jimmy Brown around the corner can and do boast that the aforesaid little Katie or Jimmy is healthier than their Mary or Sammy. It puts family pride on a sensible, practical and valuable basis—in fact, makes family pride something really worth while, and proves, moreover, that it is justifiable.

Taking His Chest Measure.

Shallow waters make most din.

Not so good to borrow as to be able to lend.

You cannot climb a ladder by pushing others down.

Nothing except a battle lost can be half so melancholy as a battle won.

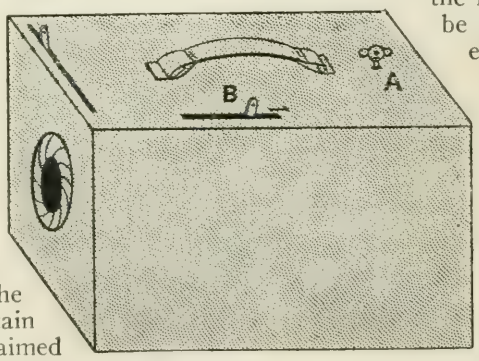
The true use of speech is not so much to express our thoughts as to conceal them.

"SEEING" BY EAR

By J. HARTLEY KNIGHT

OPTOPHONE — that is the name of an instrument invented by E. E. Fournier d' Albe, of Birmingham University, England, "as a means of enabling totally blind persons to use the ear for discovering and locating lights and shadows of luminous objects." The first working model was shown to the Royal Society and was followed by a public demonstration of the completed instrument. Later, the optophone was tested at the Birmingham and Midland Royal Institution for the Blind. It was found that it enabled totally blind persons to locate accurately any window or bright light; to discover the shadows of objects passing between them and the light; to discover variations in the light, such as are produced by clouds passing over the sun; and to locate brightly illuminated objects, such as persons dressed in white.

The action of the instrument is based upon the peculiar property of selenium of changing its electrical conductivity under the influence of light. This property is utilized for producing an electric current, which is interrupted by a special clockwork apparatus, and so made audible in a telephone. Thus the eye is replaced by the ear as a detector of light. The improved instrument contains two sensitive selenium surfaces. It is especially designed to indicate contrasts, and is therefore best adapted for discovering objects, independently of the intensity of light, though the brightest light naturally gives the quickest and most certain indications. It is not claimed that the instrument will be of much use to partially blind people, but it is claimed that it is immediately and strikingly useful to the totally blind.



THE DEVICE FOR MAKING THE BLIND "SEE" BY EAR.

To use the optophone, the telephone is attached to one ear by means of the head band; the clockwork is wound up by means of the handle A, and the rod B is moved along the slit until a purring sound is heard in the telephone. The iris diaphragm is then closed to its smallest size and the optophone directed towards the region of the open sky—not the sun. The rod B is then moved until the purring sound becomes very faint. Should this result not be secured in this way, the sliding lid must be opened, and the small red handle near the front of the box slightly shifted until silence is obtained. The instrument is now in its most sensitive state. The passage of the hand, or other object, across the aperture is indicated by a purring sound, the loudest sound indicating the passage of the *edges*, where the contrast is greatest. The full effect takes a few seconds to develop, and slow movements are therefore more easily discovered than rapid ones. In a bright light, however, even the swiftest shadow is discoverable. Prolonged exposure to a bright light "blinds" the optophone just as it blinds the human eye, and some repose is required to let it regain its sensitiveness for faint light. In feeble light the iris diaphragm should be open to its widest extent.

Thus science has come to the aid of perhaps the most wretchedly afflicted of all sufferers, with a device that should prove of tremendous value. "Seeing" by ear has literally become a fact for those who cannot see otherwise.

THERE IS AN ENJOYABLE "SOCIAL SIDE" TO THE FIELD DAY IDEA.

POOR FARMS BECOME PROSPERITY STATIONS

KANSAS counties got to comparing notes a few years ago and discovered that more than half of the "poor farms" in the state had no occupants but caretakers and that in many other institutions the county poor were so scarce that they felt lonesome. The situation had been sarcastically described by a county commissioner in a much-repeated epigram: "This county has no more use for a poor farm than a hog has for a hip pocket."

The Kansas State Agricultural College experts got permission from the legislature to work out a system of prosperity stations and they became overseers of the poor-farm lands wherever the county commissioners also would let them. Scientific methods could then be shown in actual operation, instead of only upon paper in bulletins.

A TRAVELOGUE IN THE FIELDS.

On "field days"—which are literally days in the fields, and not at all concerned with athletics — the farmers and their wives drive over the hills to the poorhouse to learn about how to become more prosperous. The men follow a professor of agriculture through the county farm's fields and attend a novel form of illustrated lecture. Besides

THE PROFESSOR DEMONSTRATING HIS EXHIBITS TO HIS AUDIENCE BENEATH THE TREES.

ICE SKATING ON THE ROOF OF THE RESERVOIR AT READING, PA.

these travelogues in the fields, there are shorter talks in the cool shade of an elm tree, with the audience in a semi-circle on camp stools, the professor "demonstrating" behind a temporary table made of a few two-by-fours and a plank. The exhibits to which the lecturer refers are spread out before him on the plank—ears of corn gathered that day on the farm, models of farm tools, photographs, the seed the college recommends.

SKATING RINK ON RESERVOIR

A SKATING rink for summer and winter use is in operation on the roof of the water works reservoir in Reading, Pennsylvania, and has done much to make the water commission popular, especially with the younger element of the city. The Penn Street Reservoir was constructed with a concrete roof especially for that purpose, and its smooth surface is used for roller skating all through the warm months, while as soon as the winter sets in, the roof is flooded with enough water to make an excellent ice rink. Thousands of children take advantage of this free amusement during the season, and the cost is a mere trifle compared with the pleasure which the public rink gives; less than a dollar a day for maintenance and tools.

TO DETERMINE SPEED OF A TRAIN

THE average passenger on a railroad train is curious to know how fast he is being hauled across the scenery. Here is a simple, easily remembered rule. If you take out your watch and count the number of rails you pass in twenty seconds you will have the speed of the train in miles per hour. Thus, if you cross

ROLLER SKATING ON THE ROOF OF THE RESERVOIR.

Crossing a River by Cable Bridge—Thrilling to Both Participant and Spectator.

forty rails in twenty seconds your speed is forty miles per hour. This rule, of course, only applies where the standard 30-foot rail is used. Probably, however, more roads use this standard of length than any other.

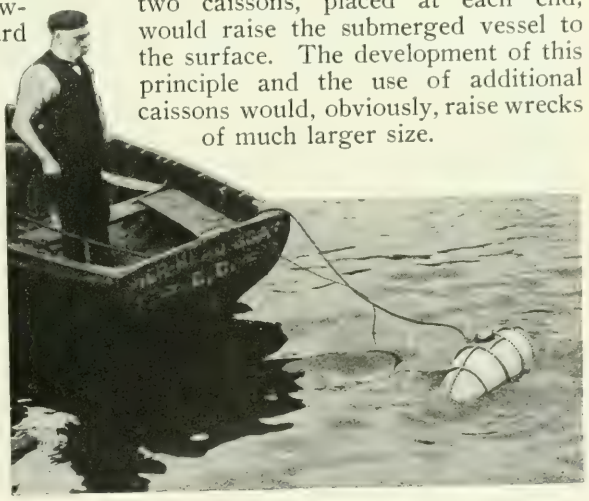
CABLE BRIDGING IN THE WEST

CABLE bridges are fast finding favor as a means of transporting supplies and machinery in the mountainous, inaccessible places of the west. Water falls are being used all over the vast region for generating power, and often the power plants are built far into the mountain wilderness, where roads are unknown. Often difficult problems confront the engineers in getting heavy machinery across deep ravines and rough valleys. In such cases the cable bridge comes in handy. Cables of great strength are strung from mountainside to mountain-side, and small cars running on grooved wheels are used. The cable-bridge car is incapable of carrying great loads, but by making frequent trips, as in the case of the industrious ant, it finally accomplishes its purpose. Often the operator takes an aerial glide across stream or ravine to save himself a long and tedious hike.

TO RAISE SUBMARINES

MR. E. J. PARSONS of Hornsey, a working man, tackling the problem of how to raise sunken ships, has invented an ingenious caisson which he claims will overcome the difficulties met with in this work. The model is two feet six inches long with a lifting capacity of 115 pounds. At a demonstration given recently in London it was filled with water and lowered, with a 56 pound weight, to represent a submerged body attached, into a dock. In less than two minutes the water in the caisson was displaced, and with the weight it rose to the surface.

For actual service, Mr. Parsons proposes to use caissons thirty feet long having a lifting capacity of 100 tons. Thus for a submarine of 370 tons weight, two caissons, placed at each end, would raise the submerged vessel to the surface. The development of this principle and the use of additional caissons would, obviously, raise wrecks of much larger size.



Demonstrating Use of Caisson Model for Raising Submarines.

AUTOMATON TO MAKE SPEECHES

THERE has just appeared a speaking and singing automaton of French design which is much better worked out than usual. A great number of movements given to the parts of the body make the figure take a lifelike appearance, and owing to the fact that the eyes, lids, mouth, head, arm and fore-arm, hands and fingers are all operated by a motor-driven mechanism in the base, the figure can take over 5,600 different positions. Speech and song in turn are given in all languages by two phonographs. The figure is mainly intended for advertising uses, and can be dressed in a great variety of costumes. For instance, it can be placed in a store window in front of a table carrying the wares, or stationed in front of the store to call the attention of passers-by and distribute bills. When the figure is inside the building, the platform can be placed on the floor level.

FRENCH AUTOMATON THAT DELIVERS SPEECHES.

AEROPLANE REPAIR SHOP

THE French army is using a very convenient portable repair shop in connection with the aeroplane corps, and it was found quite useful during military maneuvers which lately took place in central France. It has the general shape of the usual power wagon with large-sized body. When in position at the aeroplane quarters it is opened by large side flaps. These act at the same time as platforms. The wagon carries a 24 horsepower gasoline motor in front, which drives a dynamo, and the current serves to operate an electric motor drive on the rear wheels on the principle of the petrol-electric system.

The machine shop is well fitted out with a lathe, forge and emery wheel as well as benches for metal and wood working such as are needed for making repairs on aeroplanes. Motors drive the tools by current taken from the dynamo.

FRENCH PORTABLE DEVICE FOR TRANSPORTING AEROPLANES.

A Wilderness Only a Few Months Ago.

FARMING AT $250 AN ACRE

By

GEORGE J. ARTHUR

WHEN the Pennsylvania Railroad, three years ago, began looking around for a piece of land upon which to give practical demonstrations of the value of scientific farming, James McCrea, head of the corporation, took a batch of the company's officials down to the little town of Bacon, Delaware, which is in the heart of the Delaware-Maryland-Virginia Peninsula.

They picked out forty-three acres of the worst looking waste land in the locality and straightway announced that they would put a scientific farmer at work to demonstrate to the farmers thereabouts just what remarkable yields could be had from the ground if the farming idea was carried out on a scientific basis. The farmers ridiculed the idea and the railroad officials were somewhat frightened when they saw the tangled waste they had undertaken to redeem. Then they asked H. S. Lippincott, the Cornell University trained "Farmer," if the proposition could be made to "go." In spite of the rank growth of sassafrass, sweetbrier and weeds, the agriculturist saw the inherent value of the soil.

When the thicket was levelled, roots and a few stumps torn out, the wood was burned and the ash left upon the land. As soon as possible, the ground was broken and cover crops put in. Only twelve acres were dressed with manure, and not more than ten tons were used to the acre. For the rest the only fertilizer used was the green stuff that was ploughed under. For this, soy beans were found to be one of the best renovators. They were good for the stock and were also used for making oil. During the first summer the whole farm was kept green with catch crops of clover, rye and cow peas.

The start was late, yet during that first season thirty-six varieties of vegetables were raised, and all at a profit; orchards were started of apples, pears, plums, peaches, quinces and cherries. Quantities of small fruits, including raspberries, currants, blackberries, strawberries, dewberries, gooseberries and grapes were put in and all did nicely. An old peach orchard was renovated by careful spraying and trimming and was soon in a flourishing condition. The orchard was nursed along scientifically until it flowered and bore fruit that has since taken prizes at county fairs. Here are some of the results in terms of money: cucumbers, $104 to the acre; peanuts, $65; gooseberries, $250.

At present there are thirty-four acres under cultivation. Virtually ten acres remain to be reclaimed. These at first presented an appearance not unlike a

canebrake, except that the thicket was interspersed with a few large trees and many stumps. The whole was swampy land, at times almost covered with water. A ditch which ran along one end of the land has been deepened to draw off the water. The smaller growth has succumbed to the billhook and stumps have been blasted out.

A farmhouse, in much need of repair, and several dilapidated outbuildings were on the place when it was purchased. The former has been given the attention it needed, and is now occupied by the farmer and his family. A neat bungalow has been put up for the office and headquarters of the agricultural expert. Modern barns with cement floors took the place of the old, and an up-to-date pigsty was installed.

The natives were much amused at the new style pigsty. The luxury of cement floors and cleanliness for pigs seemed superfluous to them; they suggested that cigars and palm-leaf fans should be added to the equipment.

A small hothouse is being operated with success. There are opportunities on the Peninsula for hothouse men which have so far been neglected. The location is ideal for this class of gardening. The sun is so warm in winter that good crops can be grown by its heat almost without artificial aid. Part of the demonstration farm has been irrigated. For this purpose a 10,000 gallon storage tank, with an engine for pumping the water has been set up. The whole thing, while costing more than the average farmer can

PROLIFIC GROWTH OF GOOSEBERRIES ON THE PENNSYLVANIA DEMONSTRATION FARM.

afford to invest, was far from prohibitive in price. When sufficient capital for this is available, good crops are assured every year.

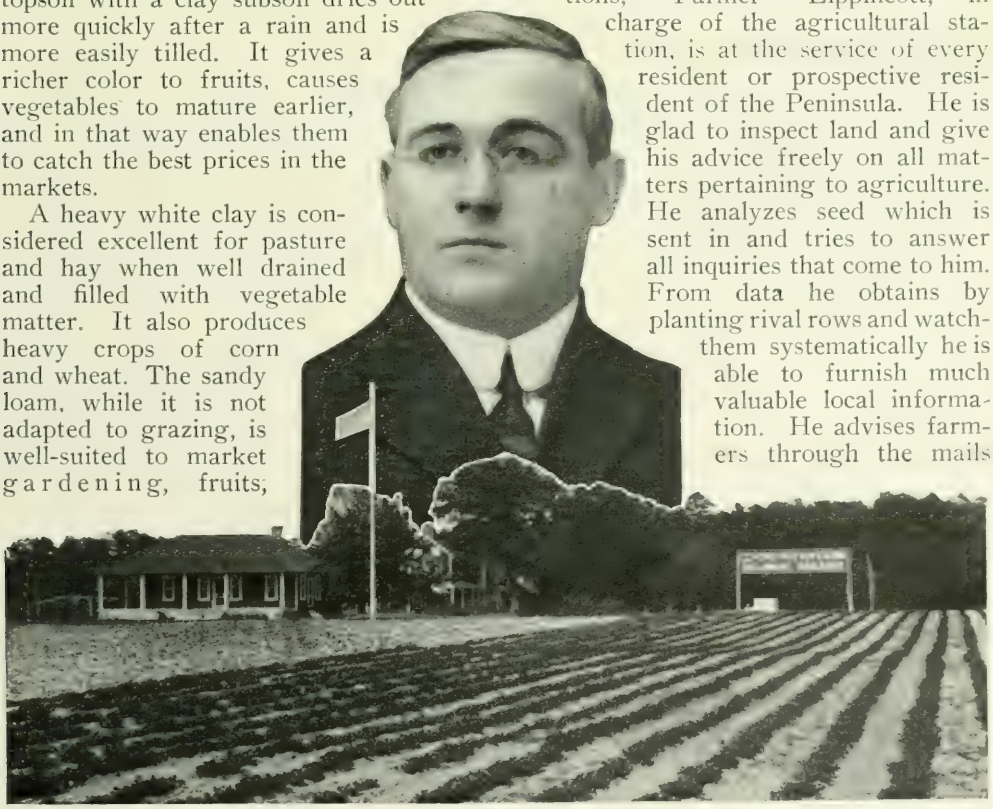
The soil at the farm and on the Peninsula generally, is alluvial, but its character is not uniform. It varies from stiff, heavy clay to a friable sandy soil which is very easily tilled and extremely productive. Probably the best and strongest soil is the red, or yellow clay. It produces acre for acre the fullest crops of all kinds of fruits, vegetables grains and when seeded to grass makes excellent pasture.

To produce these heavy crops only a small amount of fertilizer is necessary, if care is taken in the tilling and careful attention paid to the rotation of crops. Sometimes this red clay lies a few inches below the surface, under a cover of friable sandy loam. For many purposes this combination is considered much better than the clay surface. A sandy topsoil with a clay subsoil dries out more quickly after a rain and is more easily tilled. It gives a richer color to fruits, causes vegetables to mature earlier, and in that way enables them to catch the best prices in the markets.

A heavy white clay is considered excellent for pasture and hay when well drained and filled with vegetable matter. It also produces heavy crops of corn and wheat. The sandy loam, while it is not adapted to grazing, is well-suited to market gardening, fruits, early potatoes, sweet potatoes, alfalfa, and many other crops. Some of this sandy soil, which contains a large amount of vegetable matter, has a rich black color. Most of the black land is low-laying, so that the water level is near the surface. This makes it ideal for strawberries.

Different methods of treatment are employed at the farm for these different varieties of soil in order to get the best results. They speak of the Peninsula soils as being "kindly." And the experiments at the demonstration farm have proved it so. Each of the different grades of soil responds in a remarkable manner to tillage and manures. The effect of green manuring is marvelous; the sandiest soil becomes extremely productive as soon as cow peas, soy beans, crimson clover, or some other such crop has been plowed under.

Besides showing improved methods of farming through practical demonstrations, "Farmer" Lippincott, in charge of the agricultural station, is at the service of every resident or prospective resident of the Peninsula. He is glad to inspect land and give his advice freely on all matters pertaining to agriculture. He analyzes seed which is sent in and tries to answer all inquiries that come to him. From data he obtains by planting rival rows and watching them systematically he is able to furnish much valuable local information. He advises farmers through the mails



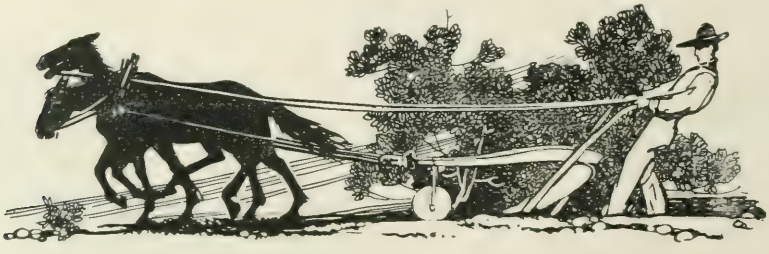
THE FARM AS LAID OUT TODAY AND THE MAN WHO DID IT—A WORK TO BE PROUD OF.

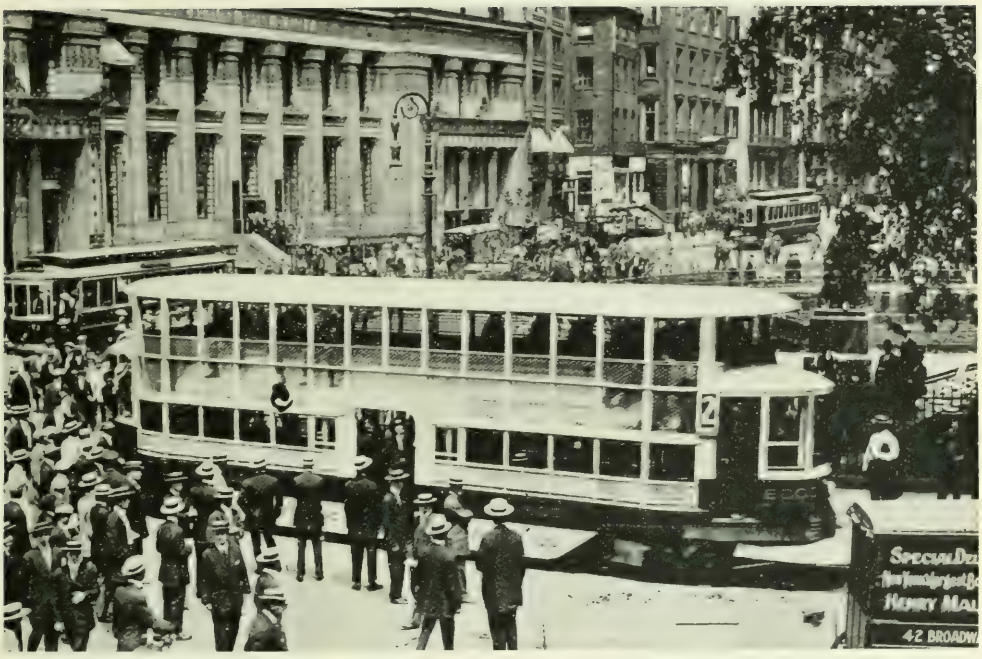
LOADING PEARS FOR THE CITY MARKETS.

and lectures at county fairs and grange meetings.

On the demonstration farm, a small application of stable manure and 500 pounds of lime brought a return the first year of forty-seven bushels of corn to the acre. Now the same soil is producing 125 bushels to the acre. Five crops of lettuce, rhubarb, beets, figs and white potatoes have been harvested at a good profit and, coming along with excellent promise, are crops of sugar corn, tomatoes, carrots, cantaloupes, okra, squash, pumpkins, watermelons, cabbage, celery, brussels sprouts, cauliflower and tobacco.

The experiments have certainly been made on an extensive scale, so far as variety of crops is concerned, and the results obtained are therefore doubly worthy of acceptance.





THE DOUBLE-DECKED STEPLESS CAR.

FISH BY FLASHLIGHT

THESE ingenious flashlight photos of fishes were recently secured at the New York Aquarium. In order to obtain them flashes were fixed on each side of the camera simultaneously, the tank being illuminated by electric light immediately above the water.

TAKEN BY FLASHES OF ELECTRIC LIGHT.

NEW YORK'S NEW CAR

THE new middle-entrance, double-decked, stepless car was tried out in New York recently on Broadway. If it proves successful 150 cars of that type will be ordered. This car is designed to load and unload as rapidly as the single deck car. It has all the features of the stepless model, with the conductor in the middle of the car and with longitudinal seats. It has a seating capacity of eighty-eight passengers and a maximum capacity of 171.

LARGEST OF SAILING SHIPS

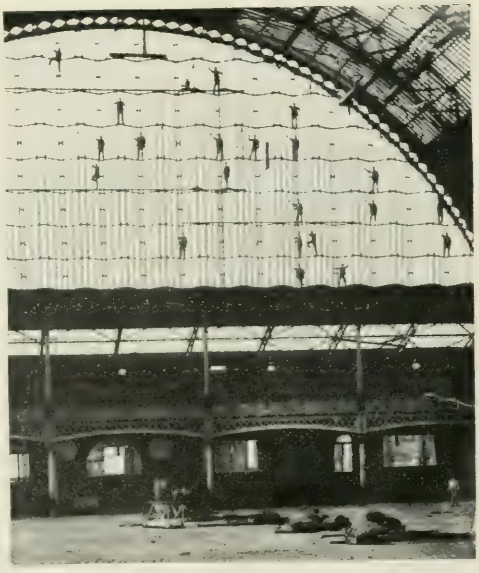
THERE was recently constructed an auxiliary five-masted barque, *France*, which, by virtue of her 6,500 tons measurement and her oil engines, is the largest sailing ship afloat. In addition to her sails, she is provided with twin

THE BARQUE *FRANCE*, WORLD'S LARGEST SAILING VESSEL.

screws driven by two oil engines, each of 900 horsepower, and each capable of giving a speed of ten knots without the use of her sails. The vessel's sail area is about 7,800 square yards. The length over all is 430 feet, the breadth, moulded, fifty-seven feet, draught, twenty-three feet, displacement 2,730 tons, deadweight 6,500 tons, gross tonnage 6,100 tons.

A double bottom is provided for carrying water ballast, and there is also a forepeak to ensure sufficient stability when the vessel is without cargo. The *France* has been chartered for three years to transport minerals from New Caledonia to France. It is anticipated that from fifty to sixty days will be required for the voyage, a saving of at least thirty days on the best passages made under sail-power alone.

The big five-master when under a good pressure of canvas and with her twin engines going will be able to make seventeen knots; under her oil engines, ten knots.



PAINTING "OLYMPIA," LONDON'S GREAT THEATRE, FOR SPECTACLES AND PAGEANTS.
It will be noted that the workmen seem like so many spiders. Four tons of paint are required for the roof alone.

HOW BUSINESS MEN SAVED A COTTON CROP.

BUSINESS MEN PICK COTTON

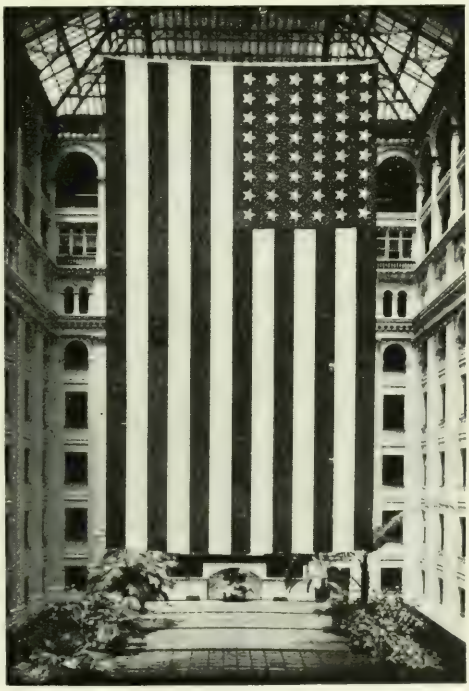
THE large cotton crop and the scarcity of laborers in Texas this past season resulted in many unusual developments, unique among which was the action of business and professional men of Sherman. Farmers were in dire need of men to pick cotton but few were to be had at any price. The situation was critical for if unpicked at the proper time the farmer would stand to lose a large amount of money. To meet the situation, lawyers, doctors, bank presidents, merchants and others of Sherman held a meeting and decided to go into the fields and assist farmers in gathering their crop. It meant as much to the city as to the farmers.

So every afternoon for three weeks a hundred Sherman citizens met at 4 o'clock in the afternoon, got into automobiles and were whisked away to the fields where they picked cotton until six o'clock and were taken back to Sherman with healthy appetites. The farmer thus saved his crop and the expense of hiring extra hands.

The long apron appearing sacks are thrown over the shoulder and in them the picker dumps his cotton.

One of the effects of the big cotton season was detrimental to the rebel cause in Mexico for railroads declare that at least thirty thousand Mexicans, thousands of them who had been in the revolutionary ranks, crossed the boundary line to pick cotton, in the United States.

A good cotton picker can earn $4.00 to $7.00 per day and his meals and lodging are also added to this amount.



LARGEST AMERICAN FLAG EVER MADE.

HUGEST OF AMERICAN FLAGS

FLAG Day at the National Capital is celebrated each year by the several departments of the government and each strives to outdo the others in the elaborateness of the ceremonies.

In 1912 the Post Office department

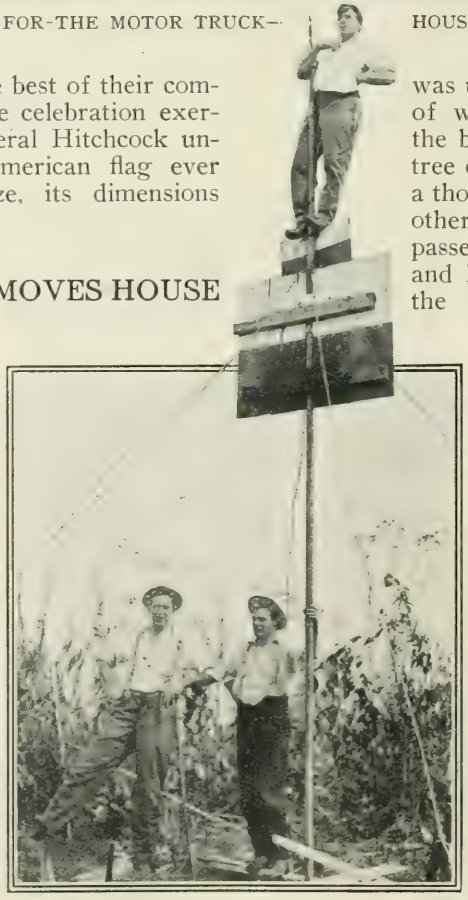
NEW USE FOR THE MOTOR TRUCK—HOUSE MOVING.

officials rather had the best of their competitors, as during the celebration exercises Postmaster General Hitchcock unfurled the largest American flag ever thrown to the breeze, its dimensions being 62½ by 39 feet.

MOTOR TRUCK MOVES HOUSE

A FIVE-ROOM cottage was moved for a distance of several miles by means of a motor truck in Los Angeles recently. It progressed through the streets at a much livelier gait than is usually taken by a moving house. The cottage was placed upon trucks with iron wheels, and a block and tackle was attached securely to the front of the building. About a thousand feet of wire cable was used to tow it, one end of which was fastened to the base of any convenient tree or telephone post about a thousand feet ahead. The other end of the cable was passed through the pulley and hooked to the rear of the motor truck, which brought it along a cable length at a time. By this method rapid progress was made.

It was found necessary to load twenty or more sacks of ballast over the rear wheels of the truck to make traction, and it was also essential to keep the radiator filled with cool water whenever it showed a tendency to heat and boil over. This novel use of the commercial car hints of its vast possibilities.



THE HIGHEST POINT ON THE ISTHMUS OF PANAMA BETWEEN THE ATLANTIC AND THE PACIFIC—BALBOA HILL.

A SLIGHT MODIFICATION IN THE DESIGN OF THE $2.50 BROODER—A SIX-LIGHT SASH IS SUBSTITUTED FOR THE TRANSOM SASH.

CHICKEN BROODER THAT'S SANITARY

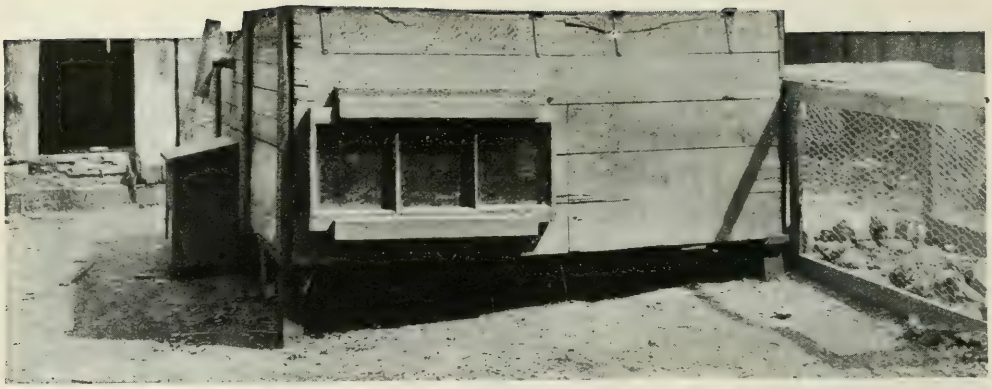
By

GUY E. MITCHELL

THE piano packing box offers numerous opportunities to the chicken grower, for it will enable him to construct both large colony houses and various styles of brooders. A majority of the ready-made brooders on the market today are difficult to keep clean. With a view to overcoming this fault a combined brooder and colony house can be constructed after the plan shown in the illustrations at a cost of a few dollars.

Piano boxes may be purchased from dealers at prices ranging from seventy-five cents to five dollars. The one used for this structure cost but $1.25 delivered. This is a price, however, which governed a box of good construction with tongue and groove joints. Others which are cheaper in price may have open seams, but even these may be utilized by covering the entire box with one or two-ply tar paper.

After the box had been delivered it was taken apart. In this operation, as was afterwards learned by experience, great care should be taken to avoid splitting the boards. The next process is putting the box together again. What was once the back of the box is laid flat on the ground to become the bottom of the brooder. The top of the box is put on in its proper place, but instead of nails, six-inch strap hinges are used, and it now forms the rear of the structure. The former sides of the box are now nailed to the back, care being taken not to nail them at the bottom. The reason for this is soon made obvious. The three-foot board which was formerly on the front of the box, forming the sloping section, is next nailed to the sides—

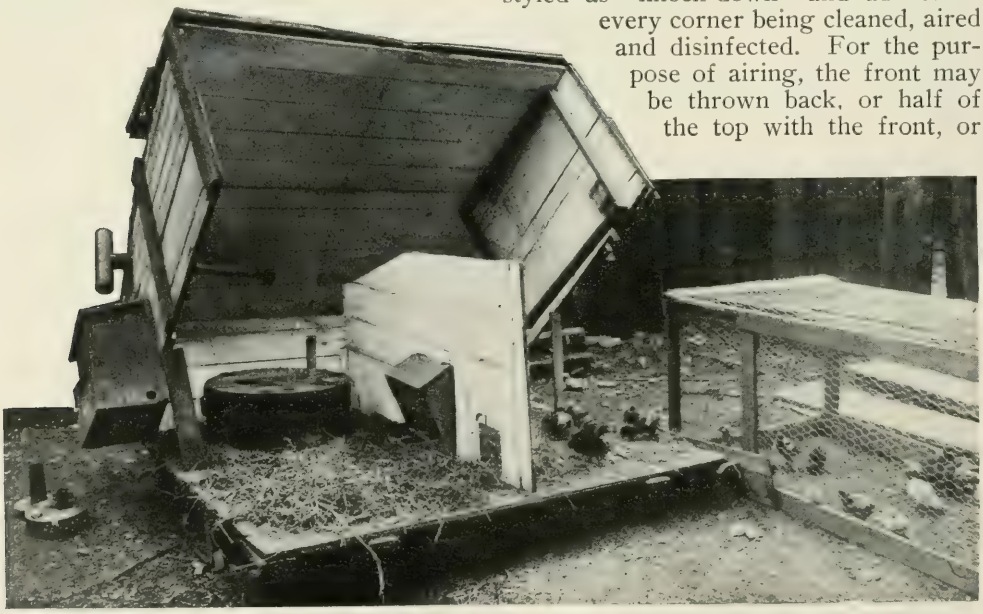


THE $2.50 BROODER CLOSED FOR THE NIGHT.

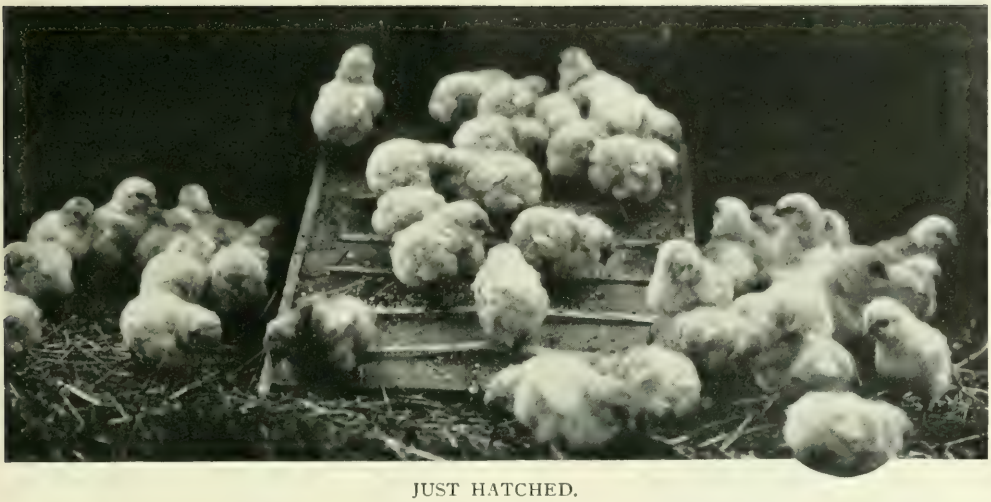
or ends as they now are—and to the back. The rest of the front of the box is now laid on, completing the roof of the brooder, but is not nailed, being merely fastened to the sloping portion by two four-inch strap hinges. There is one portion of the box yet unaccounted for—the bottom. This is sawed in two—one half being secured to the roof by two four-inch strap hinges. The other half can be discarded if desired and a six-light window substituted, or a transom sash may be adopted, this portion too being attached by means of four-inch hinges.

The brooder is now completely fastened together. A partition should next be inserted. Its plan is so simple, that it is not necessary to dwell at length on its construction. This partition divides the brooder into two chambers, the right, which may be used as an exercising room for the chicks, amply protected by a screen door in the front, and the left, as the nursery. Of course the usual means of egress to an outside run should be cut into either or both sides.

The main idea in designing this brooder was not only economy but sanitation, as its construction is what is styled as "knock-down" and admits of every corner being cleaned, aired and disinfected. For the purpose of airing, the front may be thrown back, or half of the top with the front, or



THE ROOF AND SIDES MAY BE LIFTED BACK TO PERMIT OF THOROUGH CLEANING.



JUST HATCHED.

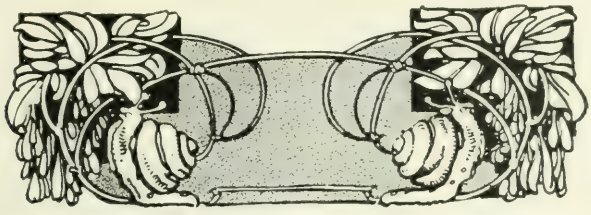
when it is necessary to clean out the brooder or whitewash the inner walls, the entire top and sides may be lifted back, leaving nothing but the floor. Four hundred chicks were raised in a brooder of this class during a single season with remarkable success and not once was there an indication of lice or other pests other than a few cats which attempted to fish out a few chicks through the inch-mesh wire.

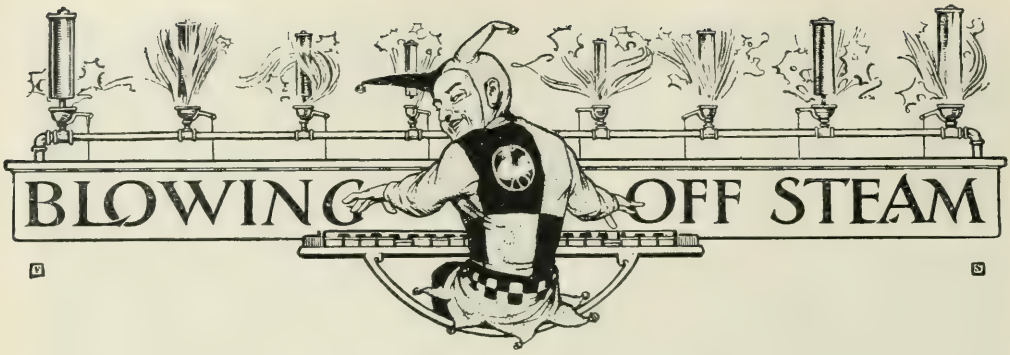
The floor can be swept clean, and, if desired, tar paper may be laid down and covered with litter. This will permit of easy cleaning as the tar paper can be withdrawn, leaving the floor bare and unsoiled.

A general resumé of the cost of this brooder, exclusive of the original cost of the cover, which is removable, is as follows:

Piano box	$1.00
Hauling	.25
Sash (second hand)	.25
Hinges and screws	.30
Paint	.30
Tar paper	.20
Poultry wire	.10
Whitewash	.05
Nails	.05
Total	$2.50

That's certainly a cheap brooder, isn't it? and satisfactory, too.





No Likeness

"GEESE are supposed to be symbolic of all that is foolish."

"Well, go on."

"But you never see an old gander hoard up a million kernels of corn and then go around trying to mate with a gosling."—*Town Topics.*

His Implements

THE small daughter of the house was busily setting the table for expected company when her mother called to her:

"Put down three forks at each place, dear."

Having made some observations on her own account when the expected guests had dined with her mother before, she inquired thoughtfully:

"Shall I give Uncle John three knives?"—*Kansas City Star.*

Duty Held Him

THE traveling salesman had four minutes in which to catch his train.

"Can't you go faster than this?" he asked the street-car conductor.

"Yes," the bell-ringer answered, "but I have to stay with my car."—*Life.*

Keen Cut

"WOULD you marry him if you were me?"

"I'd marry any one that asked me, if I were you."—*Houston Post.*

Not Enough On

"SHE dances with abandon," remarked the advance agent for the Salomé act. "Then no permit in this town," retorted the chief of police. "We require more covering than that."—*Louisville Courier-Journal.*

Tough Indeed

"MORE tough luck," whispered his wife.

"Well, what now?" he muttered.

"You know Miss Green never sings without her music?"

"Yes."

"Well, she's brought her music."—*Detroit Free Press.*

Speaking Their Little Hearts

THE evening callers were chatting gaily with the Kinterbys when a patter of little feet was heard from the head of the stairs. Mrs. Kinterby raised her hand, warning the others to silence.

"Hush!" she said, softly. "The children are going to deliver their 'good-night' message. It always gives me a feeling of reverence to hear them—they are so much nearer the Creator than we are, and they speak the love that is in their little hearts never so fully as when the dark has come. Listen!"

There was a moment of tense silence. Then—

"Mama," came the message in a shrill whisper, "Willy found a bedbug!"—*Everybody's.*

Does Heaven Know?

MRS. CLANCY—"The daredivil *would* loight his poipe wid a stilk av dynamite, and——

MRS. HOGAN—"'Twas jest loike Tim! What'll he be doin' next?"—*Puck.*

No Better

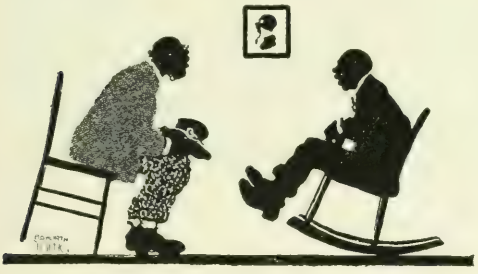
SILLICUS—"There is honor among thieves."

CYNICUS—"Nonsense! Thieves are just as bad as other people."—*Life.*

Rocking for Time

A RICHMOND darky called upon an old friend, who received him in a rocking-chair, says Lippincott's. The visitor at once observed not only that his host did not rise, but that he continued to rock himself to and fro in a most curious way, similar to that of a person suffering from colic.

"You ain't sick, is yo', Harrison," asked the caller anxiously.



"No, I ain't sick, Mose," said Harrison.

A moment's silence, during which the caller gazed wide-eyed at the rocking figure. "Den," continued Mose, "why in goodness does yo' rock yo'se'f dat away all de time?"

Harrison paused not in his oscillations as he explained: "Yo' know dat good-fur-nothin' Bill Blotts? Well, he done sold me a silver watch fo' five dollahs, an' ef I stops movin' like dis, dat watch don't go!"

Well Expressed

"THAT young Galey is a chip of the old block, isn't he?"

"Rather a tooth of the old rake."—*Judge.*

Sure

PROFESSOR, addressing class—"How simple, and yet how sublime, is the beautiful and detailed description which Pliny the younger gives us of the house in which he lived."

SMART STUDENT—"Most likely he wanted to sell it."

Amateur Work

"THIS poem was written by a prominent lawyer of this city. Has it any value?"

"ABOUT as much value," said the editor, "as a legal opinion written by a poet."—*Washington Herald.*

Complimentary

LAWYER (to judge)—"I admit that my client called the lady plaintiff a cow, but, seeing the price of meat, I consider that rather as a compliment than an insult."—*Sacred Heart Review*

Where They Do It

"OH, the ease with which some men can master great difficulties!" sighed the sweet maid.

"Oh, yes, I read novels, too," commented the young man.—*Brooklyn Life.*

The Wretched Creatchaw!

LORD ROCKSAVAGE, who leads the Duke of Westminster's set, is handsome, a fine rider, a superb shot, and very, very smart in dress. He was strolling, one warm and sunny winter morning, on the terrace at Monte Carlo. From the cut of his gray flannels, a pickpocket realized Lord Rocksavage's opulence and attempted to steal his sovereign purse. But the young nobleman seized in his strong brown hand the pickpocket's grimy paw, and, looking at it disgustedly, he said, as he flung it from him: "How dare you put your hand in a gentleman's pocket without washing it first?"

The New Way of Collecting Mail.

MOTORCYCLE FOR COLLECTING MAIL

EXPERIMENTS recently conducted in Washington, by the Post Office department, with new collection boxes and patented attachments on motorcycles in use by the collectors, have proved so successful that the Department already is preparing to install the new type of boxes in other large cities of the United States. One carrier's route in Washington already has been supplied with the new boxes, the old ones having been removed. As soon as possible, the new design will find its way to all the larger American cities.

With the new system, the carrier does not have to stop the motor of his cycle, or dismount while opening the letter boxes and taking charge of their contents. The motorcycle is especially made for mail collecting purposes. It is equipped with a big bin to the front of the cyclist, and always under his very eye. The motorcycle is momentarily halted with the bin in front and just under the front of the letter box. The postman turns the lock on the box, and the bottom drops to an angle of forty-five degrees. The bottom and sides form a chute which send the entire contents into the bin without handling.

When the lever that controls the bottom is released by the carrier's hand, the bottom snaps back into its place and locks automatically. A slight tug at the lever indicates to the carrier whether or not the box is securely locked.

REDUCING STREET CAR ACCIDENTS

IT required only one month for Chicago to demonstrate the rather significant fact that sixty per cent of the accidents sustained by passengers and pedestrians in getting on or off or passing in front of street cars can be eliminated. The principal factor in this big reduction in the hazard of life and limb on crowded city streets is what has been called the "near-side" car, from the nature of its construction, but which really deserves the name of "accident-proof."

The "accident-proof" car is so constructed that the process of loading and unloading is all carried on over the front platform, where both motorman and conductor stand. The conductor never leaves his station and it is unnecessary for the motorman to look out of the door toward the rear platform to see if anyone is getting on or off. There is no rear platfrom on the accident-proof car, but a small door and step which are used only in emergencies.

The rear platform of the new car is occupied by a wicker cushioned bench which is in the nature of an observation seat. The entire construction gives patrons much more room, and a practically even temperature.

New Street Car That Tremendously Reduces Accidents.

DRAWING ROOM FINISHED IN CYPRESS—SUGI FINISH.
Close counterfeit of the famous Japanese Sugiwood.

NEW PROCESS OF FINISHING CYPRESS

By

ROBERT H. MOULTON

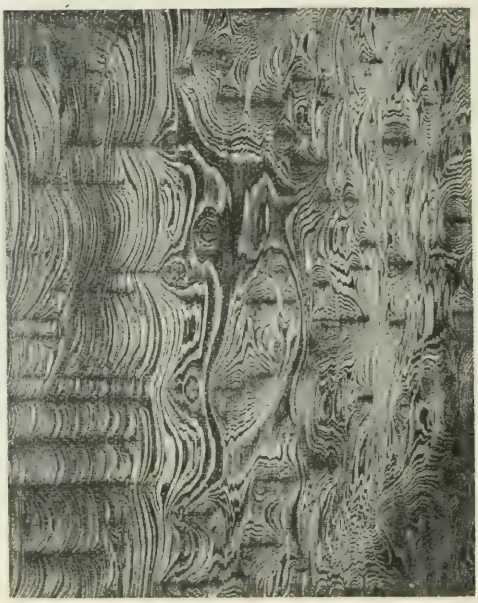
FOR many centuries Japanese craftsmen have given to their chief commercial wood, sugi, a finish which has been the wonder and admiration of Oriental travelers. The method employed in treating the wood remained a secret for a long time, but finally a keen sighted American discovered that the effect was produced by first burning or charring the wood and then rubbing the char out with rice straw.

The Japanese sugi is rather soft, easily worked, close grained, and when cut into flat-sawed boards shows a beautiful figure. The spring growth is much harder than the summer growth so that when fire is applied to a sugi board a degree of heat which completely chars the softer grain will merely discolor the harder grain. Then when the burned pieces are rubbed until all the charred portions are removed, the darkened grain is left standing out like an embossed surface against the lighter colored soft grain.

With the secret of treating the wood in his possession, the enterprising American began to apply the process to various American woods with a view to finding

one that would give the same effect as that produced on the sugi. After many experiments he discovered that cypress was the ideal wood; practically the only one that would stand up under the sugi process and come out a real artistic triumph.

Not only is cypress free from resin and pitch, a condition which is necessary to the success of the sugi treatment, but by reason of the unusual degree of difference between the hardness of the spring and summer growths, it presents a superior contrast after the scorching and brushing out process.



Beautiful Effect Produced by the Sugiing Process

The sugi treatment is rapidly coming into favor as a means for producing one of the most novel, beautiful, economical and easily attained effects ever obtained on any wood for interior trim, as well as on special furniture and innumerable small articles. Its extreme simplicity will undoubtedly appeal to amateur as well as professional craftsmen.

The only tools necessary are a gasoline torch, such as is used by painters or plumbers, and an ordinary steel wire brush or a small stiff-bristled scrubbing brush if the wire brush is not available. An ordinary scrubbing brush should be used after the wire brush, if both are at hand. The torch should have as large and as hot a blue flame as possible, since speed in burning the wood is important. The burning is for the purpose of coloring the hard parts of the outer grain only, and it is important not to burn too deeply. A few experiments on small pieces of wood will teach all there is to know.

In selecting cypress for sugi work care should be taken to see that the wood is flat grained, with very little edge grain, and that it is perfectly dry. Edge-grain strips of cypress, are, however, excellently adapted for the frames of trays, etc., being treated in the same way. The effect is darker and of course the convolute pattern is absent but the resulting contrast is much coveted. The only defects to be avoided are splits, large season checks and unsound knots. The intense heat of the torch will invariably warp the boards, but this should cause no worry. If they are set aside immediately after the burning and allowed to stand for two or three days, they will straighten out again. They are then ready for the rubbing process. The rubbing should be done, first with the grain, and then across the grain, but diagonal rubbing should be avoided.

The work of the wire brush leaves the board completely covered with a fine dry powder, which must be entirely removed. This is done with a small dry scrubbing brush, which is handled vigorously to polish the raised surface. Cloth should not be used to remove the powder, as it will only rub it in instead of removing it.

The final finish depends upon the taste of the operator. If the process is completed after the removal of the powder, the board will be softer in tone and less brilliant than if waxed. Ordinary floor wax, however, will bring out the full effect of the grain. The wax should be applied and then polished with a bristle brush. An excellent way to give color to the board is to apply ordinary lead paint of the desired color and then immediately remove all that can be rubbed out with cotton waste.

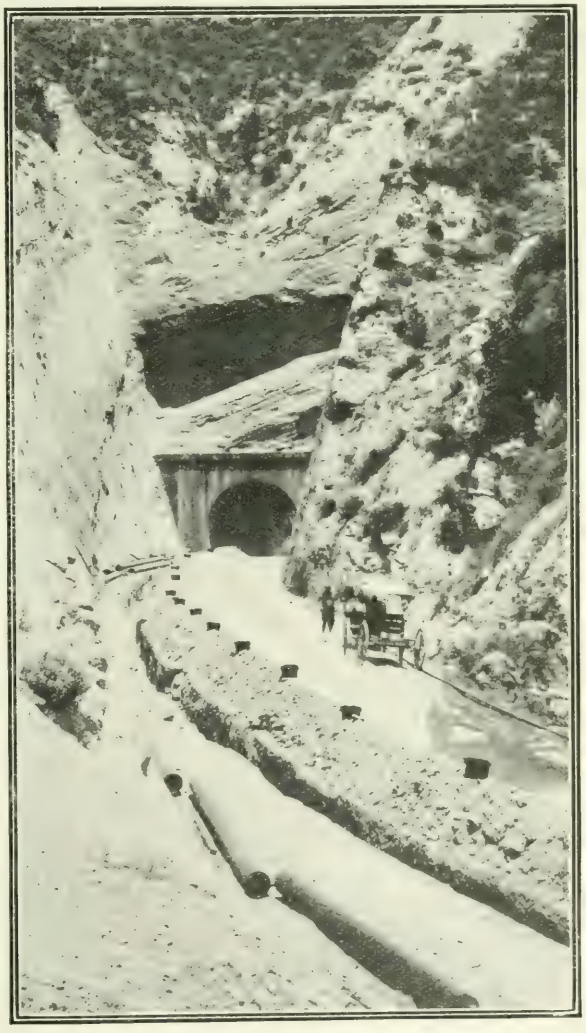
BUILDING AGAINST TIME AND THE DESERT

By

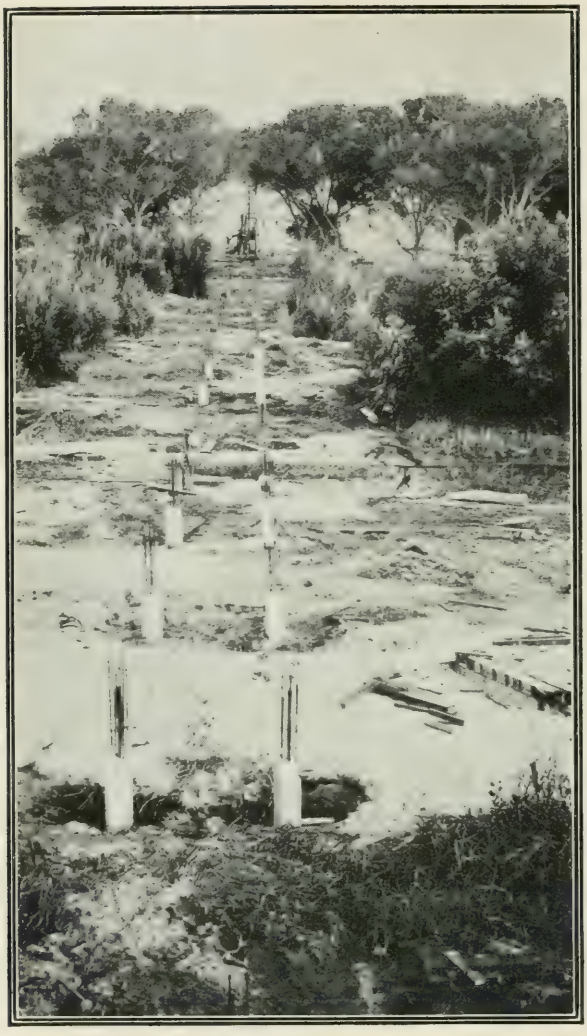
A. H. MARTIN

RANKING high among the engineering feats which have subjugated the arid West is the building of the natural gas pipeline from the midway oil fields to Los Angeles. Arrayed against the engineers were the deadly heat of the Mojave desert, the absence of water, and presence of health-killing alkaline when the precious liquid was obtained. High mountains and yawning canyons had to be conquered, and the contract stipulated the work must be completed within five months.

From the first the unfavorably natural conditions presented formidable obstacles. As the greater part of the work was necessarily performed under the torrid desert sun, the problem of maintaining an efficient working force immediately claimed paramount attention. Under the fierce rays the temperature mounted to 120 and 125 degrees, with no shade available for miles. Some of the camps were fifteen miles from water, and wagons were employed to transport the fluid from wells to the camp. Alkaline, the deadly mineral that strikes with relentless might at the health of the strongest, abounded in every bucket of water, and under the combined effects of the water and heat men crumpled. Hundreds of workers bowed to the twin scourge and filled the camp hospitals. Others, more robust quit in disgust after a few days' labor. Despite this terrible handicap the engineers steadily kept a force of 2,100 men at work, and in the closing weeks increased this to 3,000. By desperate efforts men's places were filled rapidly with new ar-



THE DITCH FOLLOWING A COUNTRY ROAD.



Laying the Line on Piles Across the Bed of the Santa Clara River.

rivals. But since the work of construction commenced over 6,000 names have appeared on the payrolls. Fifteen camps were maintained, with three central divisions arranged. Lemons to counteract the effects of the alkaline and immense quantities of ice were required.

Aside from the question of handling the labor satisfactorily, the transportation of supplies and laying of the pipe presented formidable difficulties. In the three divisions, ten mammoth auto trucks, having an approximate capacity of ten tons, and seven hundred head of stock were employed. The trucks transported the forty-foot sections of pipe, and the wagons were used for transport of provisions, tools, and other supplies. The highest point of the line is near Liebra mountain, where the pipe was laid nearly half a mile at an elevation of 4,200 feet.

After leaving Tejon Pass, 4,000 feet above sea level, the route descends rapidly, and at several points pile and suspension bridges had to be constructed to convey the line across canyons and swampy ground.

At San Fernando wash the engineers were forced to design and construct a novel suspension bridge at the cost of several thousand dollars. Steadily in advance of the line was constructed an excellent road, solidly built and following the shortest practical route from Midway to Los Angeles. Although time pressed, the engineers built well. Over thirty-two miles of temporary telephone lines were strung to facilitate rapid work. Ten patrol stations were established and every section of the line zealously guarded.

The line consists of twelve-inch pipe and the total cost attendant upon its construction approximated $1,500,000. The company is contemplating the laying of a second line, which will be composed of sixteen-inch pipe. Eventually it is planned to complete a third line of like dimensions. It is estimated the total cost of the completed system will approximate $6,000,000, and the triple line will have a capacity of nearly 120,000,000 cubic feet per day.

The line was designed and constructed for a gas company in Los Angeles. The natural gas is obtained from wells in the Buena Vista Hills section of the midway oil field.

It is planned to supply the gas to manufacturing and commercial institutions for power and fuel, the promoters expecting to make Los Angeles a smokeless manufacturing city of the first rank.

OUR BOILING VOLCANOES

HALEMANMAN, situated in Hawaii, is one of Uncle Sam's few active volcanoes. It has only been thirty years or so since Halemanman actually erupted and sent streams of lava coursing down its mountain sides. After this demonstration the volcano retreated a few hundred feet into its crater and therein has boiled like a merry caldron ever since. Upon occasion the molten lava pushes itself almost to the crater's edge and again it retreats growling deep into its throat. Great numbers of visitors to the Hawaiian Islands go to view the wonders of Halemanman. By day they stand on the crater's edge and watch the boiling of the molten rock below them. At night they come again and watch its redhot surface flame out of the darkness. They trace the flow of the lava that it has recently erupted down the mountain sides. There they find the cooling stone to have been poured over a mountain cliff and to have "frozen" in the very process of pouring. So is a great cataract, as it were, turned to stone in mid air. At other places they find that the lava, having cooled to the constituency of a tough dough, has rolled and piled and folded upon itself in many a fantastic shape while it was in the very act of hardening into stone.

HALEMANMAN VOLCANO AT NIGHT.

WOULD YOU VENTURE UPON THIS BRIDGE.
A shaky-looking structure in use near Creede, Col.

DANGEROUS LOOKING BRIDGE

THE stability of the bridge shown in the accompanying picture looks doubtful enough even as a foot bridge, but as the road bridge for heavy traffic, it looks decidedly shaky. On the contrary, the bridge is so stable that a heavy team crossing it will cause no perceptible vibration. It has withstood the continuous flow of a mountain stream for some fifteen years, where at times the water

has been extremely high. The center pier and abutments are filled with large stones, the log cribbing serving only to keep the stones in place.

There are fifty-four tiers of logs in the center pier and it is about thirty feet high, but the team which can, upon close inspection, be seen about to cross the bridge from the left will give a better idea of its size. It stands near Creede, Colorado.

TO GET SAFE DRINKING WATER

FILTRATION, as it is commonly carried on, is of little or no value in the purification of germ-laden water, while in many cases, where filters are not properly cared for, their use adds to the danger in using the water passing through them.

Only one method of sterilizing water is efficient, that is boiling, but as commonly carried on in the home the water is rendered flat and tasteless and does not satisfy the thirsty one. The apparatus shown in the illustration is a new device for sterilizing water by heat produced with an electric current. The unsterilized or raw water, as it is called, is allowed to flow into the apparatus from the large bottle shown at the top and stands at a predetermined height in an outside section of the cylinder below, from which it flows into the tubular attachment where it is heated to the boiling point by electrical resistance. The boiling process causes the sterilized water to overflow from the heating tube and pass back into an outside shell in the cylindrical body of the apparatus where it is cooled by contact with the chamber containing the cold raw water.

Swing Operated by Rope Power.

The invention of a clever Californian who is shown "on the job."

The boiled water, in giving off its heat, raises the temperature of the raw water to nearly the boiling point so that when it arrives at the heating tube very little more heat is required to bring it to a boil. In this way economy of the electric current is effected and the sterilized water is cooled to a great extent and made palatable for drinking purposes.

Electric Sterilizing Device to Secure Safe Drinking Water.

The water being continually in motion, as it is heated, parts with very little of its oxygen and consequently does not have the flat taste of the ordinary boiled water, but is sparkling and pleasant to drink. One does not realize that it has been treated.

As the sterilizing process is completed the water flows out at the bottom of the apparatus into another bottle, which is arranged for attachment to a cooler or may be fastened in an inverted position to the wall by means of a special bracket, after a faucet has been placed in the neck for convenience in drawing the water.

The sterilizers are made in various sizes from the smallest for family use to large ones having a capacity of many gallons for the supply of hotels and large office buildings. They are all equally simple in construction and will operate without any necessity for skilled attention.

STUDENTS FARM AT PRINCETON

By

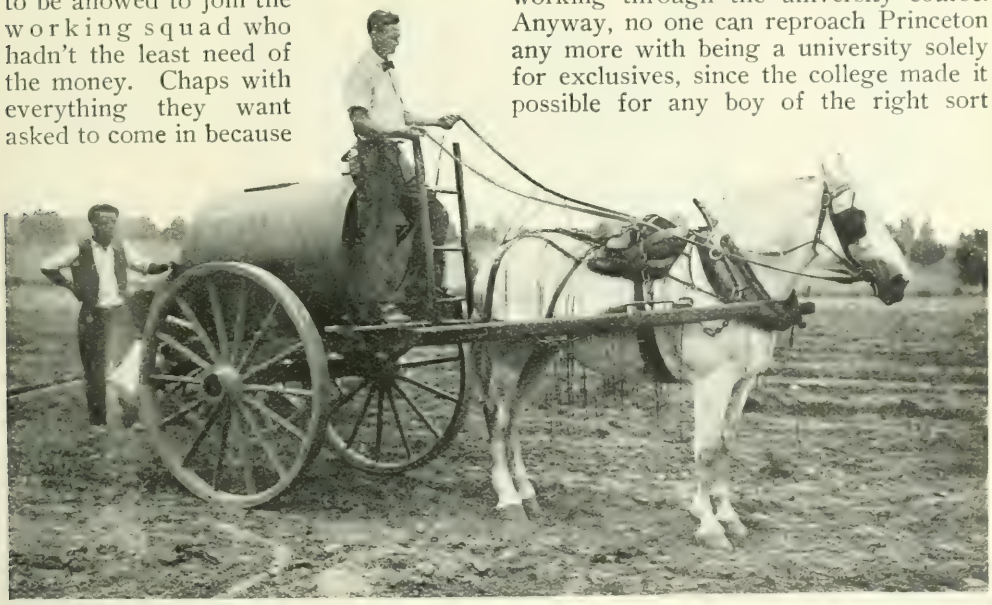
H. D. JONES

A DOZEN exceptionally well tanned students re-entered Princeton University last fall. All summer they had been working industriously at the celery beds of the college farm at Princeton.

That these students were thus working was part of a plan all thought out by their Alma Mater. These dozen young fellows were under an overseer student who knows all about farming. He was born and brought up on a farm and runs the thirty-five acre truckery in the real professional way. He had to show the young men what to do at first but there's no real bossing.

Many of the boys wanted a chance to get on this farm but naturally the number permitted has to be limited by the extent of the land. It was surprising how many students begged to be allowed to join the working squad who hadn't the least need of the money. Chaps with everything they want asked to come in because the workers appeared to be enjoying it. Football men and members of the athletic teams have had to be chased away. They have clamored to be permitted to become farmers. It appeals to them as serving the same end as training without the awful drudgery of training on track or field. But before long something will probably be done by the trustees for the clamoring throngs. From all over the country, as far as Texas, letters have come, begging for a chance to work through Princeton by putting in time on the College Farm. It will probably result in a big increase in the acreage and then the "working through" squad can be increased in numbers.

One result of the innovation has been to remove from Princeton the stigma of being a rich man's college. Perhaps that was what influenced the trustees to some extent in establishing this means of working through the university course. Anyway, no one can reproach Princeton any more with being a university solely for exclusives, since the college made it possible for any boy of the right sort



DRIVING THE WATER CART.

AT WORK WITH THE CULTIVATORS.

to get an education here without doing more than work for it. Of course the farm does not actually pay the entire bill, but the trustees look after the deficit. The student-farmers live at the college and in return for thus being provided for, till the soil.

Just the ordinary garden truck—tomatoes, lettuce, celery, potatoes—is grown. No attempt is made to grow fancy vegetables and a good market is found for the produce at the students' eating clubs and mess halls.

There are other schools at which students are given an opportunity to earn part of their expenses at farm work, but none, at present, of equal prominence. However, the example of Princeton appears to be contagious and next year students' farms will be established at several colleges and universities, especially in the middle west.

It will be strange if, out of the long list of students working on these college farms, a considerable number are not so attracted by the pleasures and prospects of scientific agriculture as to make it their life work.

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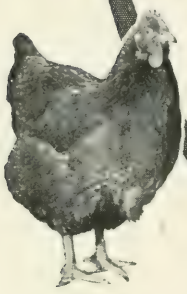
The BILLION DOLLAR HEN

By A. A. Coult



"A BILLION Dollar Congress? Why not?" drawled Speaker Reed. "This is a Billion Dollar Country!"

And now—doubtless to the incredulous astonishment of most people—it is the Billion Dollar Hen!

"Seven hundred and fifty million dollars is the best estimate for poultry products this year," casually remarked Secretary of Agriculture Wilson in his report for the year ending June 30, 1911. That estimate covers only the farm price of poultry products. If the price paid by the consumer is considered there is no doubt that it will total at least a round billion.

But take the farm-price estimate! The wheat crop of the United States for the same year was worth only six hundred millions; hay was valued at a little less than seven hundred millions; oats at three hundred and eighty millions; barley, rye, tobacco, and potatoes, all together, four hundred and forty millions; only cotton, with seven hundred and seventy-five millions, and corn, with the tremendous total of one billion seven hundred million, exceed in value the product of the hen!

Let King Corn and King Cotton quarrel for the crown, if you please! There is none to dispute the supremacy of Biddy of the Barn Yard as Queen of the Agricultural Realm.

Meanwhile—as the casual reader is catching his surprised breath—let it be noted that the new brand of scientists who devote their attention to agriculture have realized for a long time the tremendous importance of the hen as a producer of wealth. In their efforts to increase the number of eggs laid and to improve the quality of poultry products they have even capitalized the general interest in sporting contests with a national scope.

The first National Egg Laying Championship Contest ever held in America has recently been completed at the State Agricultural Experiment Station at Mountain Grove, Missouri. The fight began November 1, 1911, and the last egg was laid October 31, 1912. There were 640 entries, divided into 128 pens

of five hens or pullets each and no less than thirty breeds of chickens were represented.

The contest was held under the direction of the Missouri State Poultry Board, with T. E. Quisenberry, as the expert in charge, and every precaution was taken to insure accuracy and complete fairness.

There were a total of 87,843 eggs laid during the contest, or an average of more than 134 eggs for each contestant.

The government statistics give the average egg production as about eighty per hen per year, so the average attained at this contest was not discouraging for such a promiscuous lot of hens and pullets.

The Australians are far in advance of the breeders of this country in breeding for egg production. The leading pen in this contest averaged more than 208 eggs per hen, but the leading pen in an Australian contest which recently closed averaged more than 250 eggs per hen. Also in the same Australian contest, 360 hens, gathered from 60 different breeders, made an average of nearly 200 eggs per hen for the entire lot.

The results of the competition are extremely important. They will probably be disappointing to the breeders of certain breeds of chickens; they make it plain that changes should be made in the standards of judging at poultry shows; but they seem to firmly establish certain principles on which commercial poultry plants can be successfully managed.

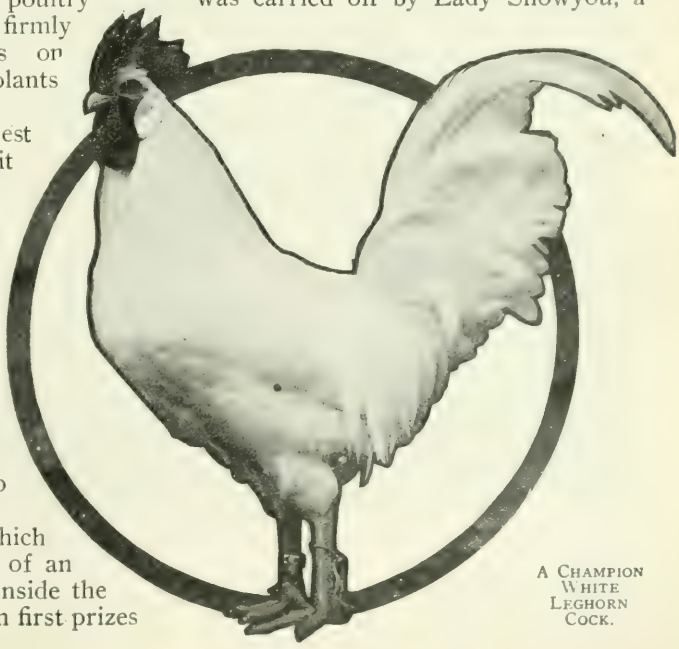
In the first place the contest establishes the fact that it makes little difference to the results which one of the egg-laying breeds is selected. None of them has any fixed advantage—as a breed—over the others. People who fail to get good results from Brown Leghorns, for instance, and who dispose of their stock and buy White Plymouth Rocks are not at all likely to better themselves.

It is not the breed which counts, but the development of an egg-laying family or strain inside the breed. Birds which have won first prizes at the poultry shows because they comply with the standard in color of plumage and other details of appearance may be worth much less from the true poultry standpoint than those of less showy aspect which have been hatched from eggs laid by hens with big laying records.

The national championship was won, for instance, by a pen of Rose Comb Rhode Island Reds, owned by D. E. Hall, California, Missouri. During the year these five hens laid a total of 1,042 eggs, an average of over 208 eggs each. Second prize went to a pen of White Wyandottes, entered by P. J. Jansen, Little Rock, Arkansas, with a record of 1,015 eggs, and third place to a pen of Single Comb White Leghorns, owned by Walter Hogan, Petaluma, California, with 991 eggs.

But by way of showing that no exclusive virtue resides in these winning breeds it may be pointed out that of the six pens of Rhode Island Reds in the contest, one pen laid only 541 eggs during the year, little more than half the record of the winners; that of the six pens of White Wyandottes, the lowest produced only 463 eggs; while, out of eighteen pens of White Leghorns, the lowest dropped to 573.

And—most instructive of all—the individual championship of the whole contest was carried off by Lady Showyou, a

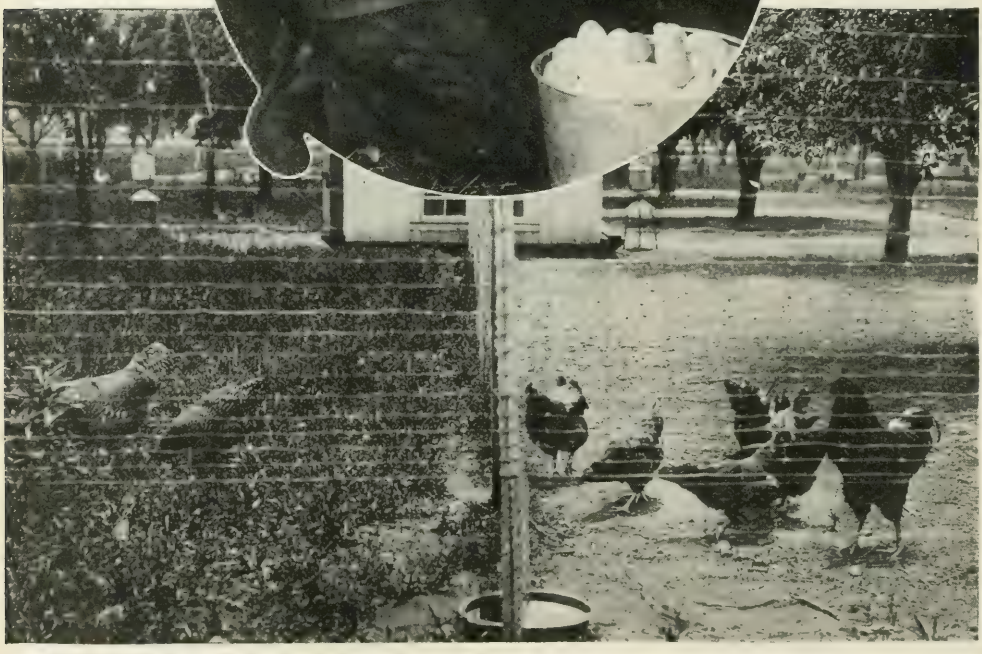


A Champion White Leghorn Cock.

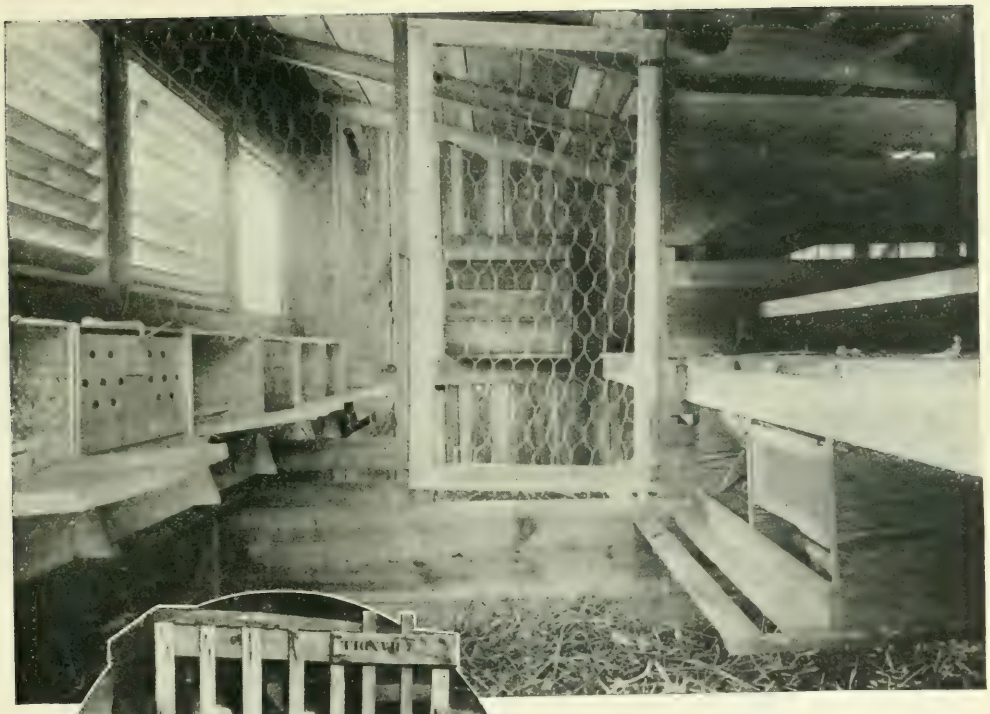
White Plymouth Rock hen, which laid 281 eggs during the year, while, of the other hens of the same breed in her pen, one laid 218 eggs and the other three only 314 eggs between them. Thus the individual championship went to a hen from a pen which won no place at all in the big race. But that poultrymen realize the vital importance of the egg-strain in the development of their industry is shown by the fact that immediately after the contest Lady Showyou was sold to a Chicago breeder for $800 cash.

This hen was two years old when she entered the contest and weighed six pounds. Her record for the year is within one egg of the best known record in this country, held by a Barred Plymouth Rock hen at Guelph, Canada, but the latter's eggs were small and contained in a thin shell, while Lady Showyou produced a uniformly large egg in good shell. Her eggs averaged a little more than two ounces apiece, a total weight slightly more than 36 pounds of eggs, or six times her own weight for the year. She did not become broody during the contest but took a month's rest during January, when the weather was very cold. She broke all known records for consecutive laying by producing 82 eggs in 82 consecutive days ending June 24th, missed one day and continued laying an egg a day for the rest of the month. To insure accuracy each contestant had a numbered metal band fastened to its right leg and all the hens were trap-nested. As

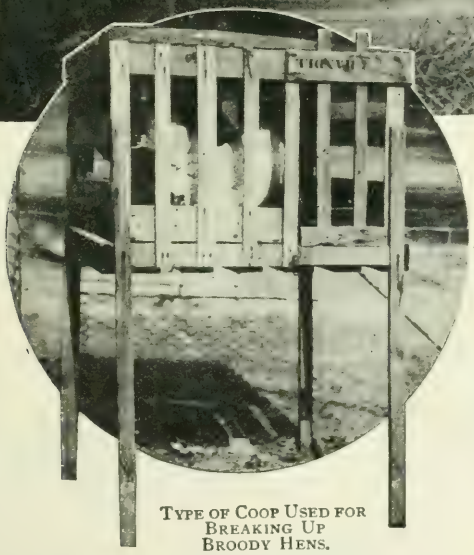
EGG GATHERER RELEASING HEN FROM TRAP NEST.
As he does so he records her band number.



THE RAISER OF POULTRY SHOULD REMEMBER THAT SOME HENS CONSUME MORE VEGETABLE MATTER THAN OTHERS.
The Partridge Plymouth Rocks, at right, have cleaned up all available vegetation. The Barred Plymouth Rocks, at left, permitted the grass to grow



INTERIOR OF LAYING HOUSE AT THE NATIONAL EGG-LAYING CONTEST, AT MOUNTAIN GROVE, MISSOURI.



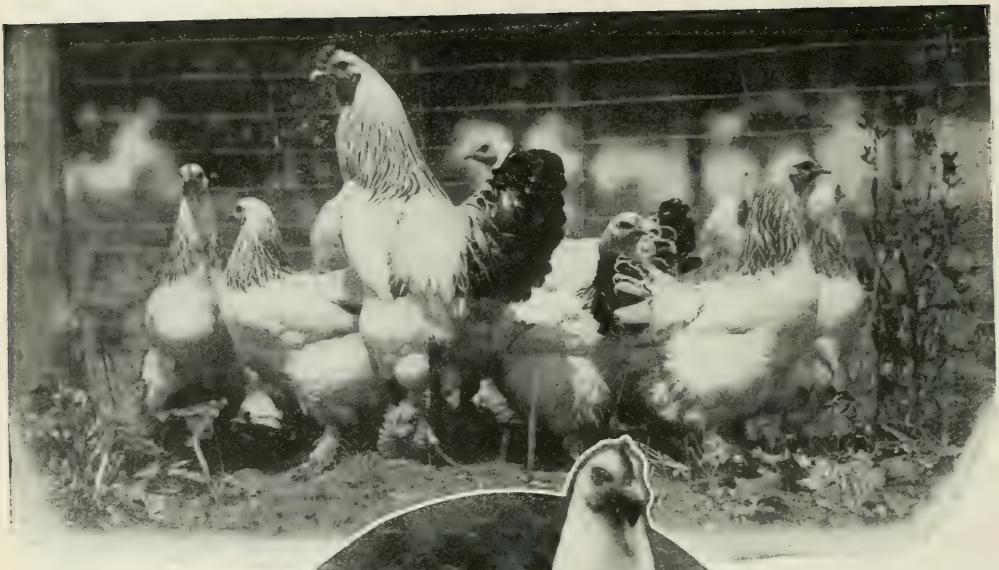
TYPE OF COOP USED FOR BREAKING UP BROODY HENS.

The bottom of the coop has one-inch spaces between the boards, to give plenty of air underneath the hen. This is more humane and less injurious than dousing with cold water or kicking the fowl off the nest.

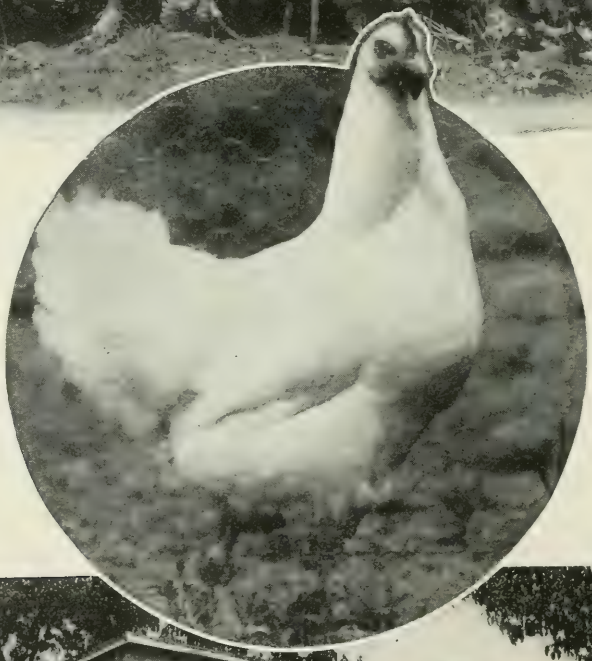
the egg gatherer released the hen from the nest, he read the number of her band and immediately marked same with pencil on the end of egg before placing it in the gathering basket. Numbered nests in the egg storage room corresponded to numbers of the pens and all of the eggs from each pen were accumulated in the corresponding numbered storage nest. The eggs were weighed at least once a week and always at the close of the month and the pen credited with the weight. The egg gatherer also made out daily credit slips showing the number of every hen which laid, together with a lot of other information for the records, such as the temperature inside and outside of the houses at 9 o'clock in the morning and at 4 o'clock in the afternoon. Reports were also made daily of each hen which was sick, broody, or otherwise out of laying condition.

All of the grain, mash, grit, and other feed consumed, was charged to each pen as delivered and the tickets turned in to Mrs. T. E. Quisenberry, the wife of the director, who was asked by the Poultry Board to assume full charge of all records connected with the National Egg Laying Contest.

Each pen had a page a month in the record books, ruled to show the individual egg laying results each day and the total for the pen each day and month; the amount of feed consumed and cost for the month; the revenue from the eggs at current market prices for the month and the profit or loss for the month; the total weight of eggs produced

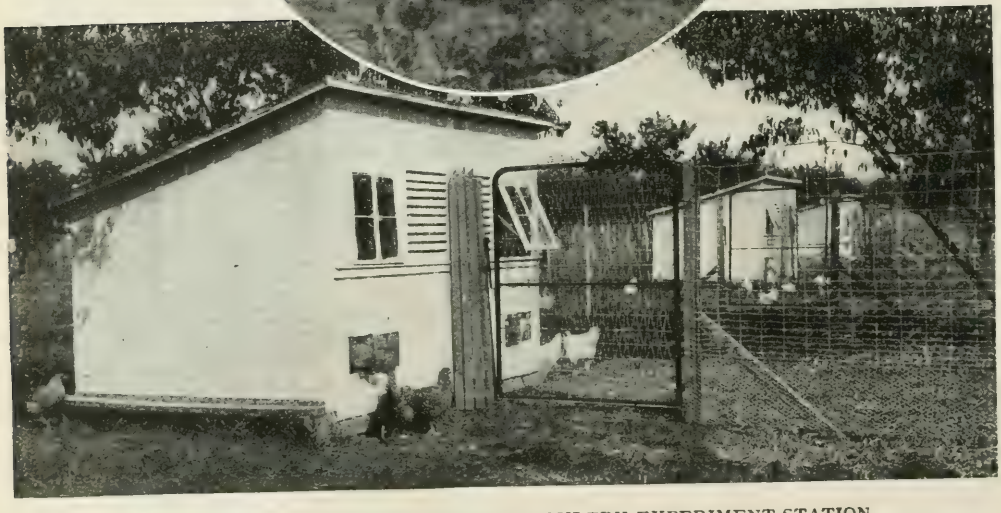


A Group of Light Brahmas.



Lady Showyou, the White Plymouth Rock Hen That Broke All Records.

She laid 281 eggs in one year, and 82 eggs in 82 consecutive days. She sold for $800.



THE YARDS AT THE MISSOURI STATE POULTRY EXPERIMENT STATION.

Each yard is 30 by 120 feet.

and the standing of the pen for the month.

Some breeds consumed larger quantities of vegetation than others. The thirty-six acres occupied by the Missouri Poultry Experiment Station covers part of a very large bearing apple orchard. The trees were sprayed three times during the season and otherwise cared for and the crop was much larger and of a finer quality on the trees in the chicken yards than in any other part of the original orchard, showing that poultry can help the fruit trees by fertilizing the ground and by destroying large numbers of insects, at the same time getting their ground rent free. Dry mash and grit were always available in self-feed hoppers and a grain mixture was fed morning and night. The following proportions were used:

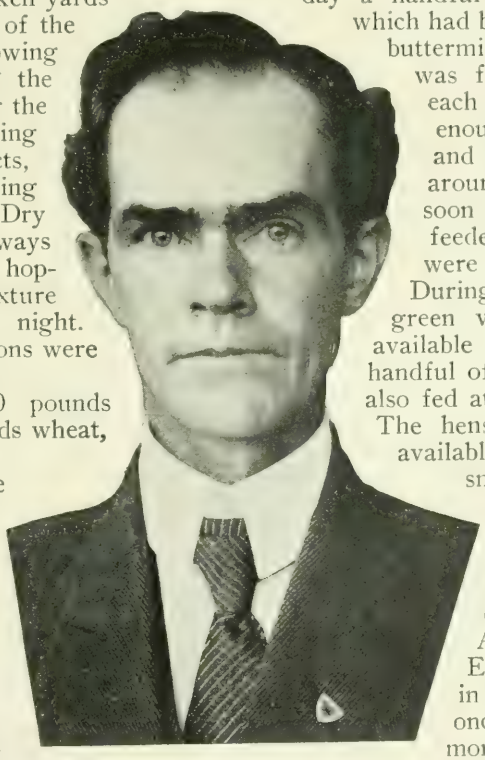
Grain Mixture—200 pounds cracked corn, 200 pounds wheat, 100 pounds oats.

During this year the grain feed will be two parts of corn and one part of wheat for the winter months, and one part corn with two parts wheat for the summer months, eliminating the oats from the grain feed for the reason that the hull caused some trouble. In order to overcome this loss of oats in the grain mixture, the amount of oats in the dry mash has been increased to three hundred pounds and the use of sprouted oats will be continued. This year the beef scraps have been increased to 250 pounds in the dry mash and the powdered charcoal has been increased to 35 pounds. Last year's dry mash was composed as follows:

100 pounds wheat bran, 200 pounds middlings or short, 200 pounds corn meal, 200 pounds rolled or ground oats, 150 pounds dry beef scraps, 75 pounds alfalfa meal, 50 pounds gluten meal, 25 pounds O. P. oil meal, 8 pounds fine table salt, 25 pounds powdered charcoal. The cost of this feed was about one and one-third cents per pound for the grain mixture and about two cents per pound for the dry mash.

One-half pint of the grain mixture was fed each morning in the litter to five hens. A little larger quantity was fed in the litter at night. The dry mash was available at all times. At 1 o'clock each day a handful of the dry mash which had been moistened with buttermilk or skim milk, was fed in a trough to each pen. This was just enough to add variety and the hens gathered around the trough as soon as they saw the feeder coming, for they were very fond of it. During the season when green vegetation was not available in their yards a handful of sprouted oats was also fed at this time.

The hens had fresh water available at all times. A small quantity of permanganate of potash was placed in the drinking water to prevent colds and diseases. A small quantity of Epsom salts was fed in the moistened mash once or twice every month.



T. E. Quisenberry, Director of the Missouri State Poultry Experiment Station.

Under the heading "Lessons Learned," Mr. T. E. Quisenberry, the director at the experiment station, has issued the following notes for the guidance of all poultry raisers:

1. That there is no variety of breed which far excels others in general use as far as egg production is concerned.

2. That more depends upon the strain of a variety as to the number of eggs it will produce than upon the variety.

3. That some hens have a born tendency to lay and others have a born tendency to put on fat. The latter kind should be culled out in establishing a laying strain.

4. That more depends upon the breed-

ing of the male as to number of eggs the offspring will produce than upon the female, yet it will pay to breed from your best layers in preference to the poorest.

5. That you should select the variety which suits you best as to color, size, and shape, and breed them up until they satisfy you as to quality and productiveness. You make a mistake by jumping from one breed to another trying to discover a better layer.

6. That it will pay the average poultryman to trap-nest his flock in the fall and winter months and breed from the pullets which lay earliest in life and from the pullets and hens which lay in the winter.

7. That the style of house used in this contest is one of the best for this climate. We find it cool in summer and comfortable in winter, and properly ventilated.

8. That hens like sprouted oats as much or better than any other green food, and they do well on it, as it aids digestion and increases egg production.

9. That a little moistened food is relished and will increase egg production.

10. That many high producers lay thin shelled eggs and that the germs are often weak. A few high producers are able to lay large numbers of eggs, fertilize them, and put vitality into the chick.

11. That the Mediterranean Class can stand more protein and fattening food than the birds of the American, Asiatic, or English classes. There is not so much danger of the Mediterraneans becoming too fat, and they require a richer food than the other classes mentioned.

12. That the egg yield from Mediterraneans is affected by extreme cold more than the other classes of fowls, because of the fact that they are closely feathered, have large combs and smaller bodies.

13. That if you give a hen reasonably good shelter, feed, and attention, she will net a reasonable profit if properly bred.

14. That the purpose of properly feeding and housing a hen is not to feed eggs into her body but to so feed and care for her that you may get out of her the eggs which breeding has placed there. Proper feeding, housing and care have a bearing on the number of eggs produced by a flock, but breeding is most important.

15. That hens must be fed and fed liberally if you expect eggs in quantities, especially if you expect winter eggs.

16. That regularity in feeding is very essential.

17. That hens must not be excited or chased, but should be handled gently.

18. That rape will color the yolk of the egg green, and onions or fish scraps will cause the eggs to taste of these if fed in too large quantities.

19. That the ground should be kept fresh, shade provided in the hot summer months, and the house kept clean. The hens cannot do well if covered with vermin.

20. That most high layers will lay practically all the color out of their legs and plumage in one year.

21. That hens lay a few more eggs if males are not in the pens with them.

22. That most good layers moult late in the season. They look tough, dirty, and weatherbeaten as a rule, as a result of their hard year's work, but the poor layers spend their time in dressing up and putting on a fine coat of feathers.

23. That the best producers have broad bodies. The back is broad and the ribs are widespread, giving plenty of room for the egg organs and digestive organs. Their bodies are solid and the birds are not loose jointed but compactly built.

24. That good layers are big eaters. A bird must have capacity to eat and digest a big amount of food if she is to lay well.

25. That a big decrease in the egg yield in winter months can be brought on more quickly by great variations in temperature, sudden changes in weather conditions, than by continued or prolonged spells of either cold or rainy weather.

26. That it will pay to keep a good hen until she is four years old. We had several hens four years old which laid over 150 eggs each.

27. That most of the high producers have good sized combs for their breed.

28. That there is much room for improvement in all varieties and breeds as far as egg production is concerned, and it is up to the breeders of this country to get busy. There are wonderful possibilities along this line.

On November 15, 1912, a second egg-laying contest was begun with 600 hens representing twenty varieties of poultry gathered from England, Canada, and twenty states of the United States. Each variety is represented by thirty hens.

"STOP POISONING MEN!"

By

BAILEY MILLARD

IF you wanted to give baths to a large number of factory workers every day and they tried in every possible way to dodge the bathing, how would you proceed?

That was the difficult problem that confronted the manager of a white lead factory in St. Louis who wished to forestall sanitary legislation and comply with the demands of reformers. Other white lead factories had supplied tubs and shower baths but the men would not use them, though skin cleansing of some sort is absolutely necessary if one is to escape from lead poisoning while working in such a place.

"We'll have to adopt a system of compulsory bathing," said the manager to the foreman.

"But we can't push 'em off the dock, and if we turned the hose on 'em they may turn the law on us," replied the foreman.

The manager studied the problem for a few days. Finally he had a great idea. As a concession to the reformers, the factory had adopted a rule that the men change their street dress for working clothes before they entered the shop and change again before going home at night. Each man had two separate lockers, side by side, in which his clothes were kept.

"Look here, John," said the manager to his assistant as he stood by the long row of little closets, "I want that partition back there knocked out so as to make one big room here, and I want the shop lockers to be arranged on that end of the room and the street clothes lockers on this end. Then I want the ceiling to be decorated with shower-baths in such a way that the man undressing at the shop end will be washed clean by the time he reaches his other clothes. Hang a towel on the door of each of the outside lockers. I guess they'll rub themselves dry before they dress to go out."

This unique system of compulsory bathing was put into effect and now the men leave the factory with very little of the deadly lead dust clinging to them. As a result their health has been greatly improved; but so wonderful was the change in their appearance at first that they were scarcely able to recognize each other in the street.

Compulsory bathing, now in vogue in many white lead factories, is but one of several effective means suggested by the American Association for Labor Legislation, through its busy secretary, John B. Andrews, from its headquarters in East Twenty-third Street, New York. The Association's biggest victory thus far has been the elimination of phosphorus from match-making in this country. This was done by the introduction in Congress of a prohibitive measure which will doubtless be adopted, and which has already resulted in factory rules that have made "phossy jaw" a thing of the past.

"What was done with 'phossy jaw'," said the square-jawed, determined-looking Mr. Andrews to me the other day, "is going to be done with that other frightful disease known as lead poisoning. We have begun a fight which will end only with its elimination, so far as factory workers are concerned. Eight states have lately enacted laws making compulsory the reporting of lead poisoning to the State Board of Health or the State Commission of Labor. In some of them the penalty for non-compliance with the law is from ten to fifty dollars, while in Illinois, where particularly stringent factory laws have been put in force, the penalty is from ten to one hundred dollars. This will result in the reporting of many cases

of lead poisoning that were formerly put under other headings.

"But that is only a beginning. We are going at this lead poisoning business hammer and tongs and we are confident of a big victory for American labor. The frightful ravages of lead poisoning in this country are a national disgrace. They take care of their workmen in Europe. In England and Germany the disease has been about wiped out, but here we have taken little account of the condition of factory workers. There is an immense amount of work to be done to overcome the criminal apathy of manufacturers in some quarters, others have responded cheerfully, anticipating the legislation, which they see must come, for the sanitation of factories."

Mr. Andrews gave a high meed of praise to Dr. Alice Hamilton, a courageous Chicago woman, who has given much time to the study of health conditions in the white lead and lead oxide industries in this country. As a special representative of the Federal Labor Bureau Dr. Hamilton has visited nearly all of the American factories, save those on the Pacific Coast. One very bad condition she has found, and that is that the deadly dry process of white lead making is almost uniformly employed in our factories which differ from the more sanitary English and German shops where the process is wet. As dust is the great danger in work with white lead, it follows that an American factory, even at its best, is more dangerous than an English or German factory.

Nearly everywhere she went on her tour of inspection Dr. Hamilton found workmen exposed to the terrible dangers of lead poisoning which superinduces many diseases, including nephritis, paralysis, heart-disease, gastroenteritis, anemia, extreme emaciation, "lead insanity," double and single "wrist drop" and "ankle drop." She found many pitiable cases of disease and death, chiefly caused by inhaling lead dust. Even in Illinois where, under the new state laws, more has been done to alleviate the sufferings of white lead and lead oxide workmen than in any other part of the country, she found that, although respirators, or "breathing muzzles," were required to be used by all the workmen in the more dangerous processes, many of the factory hands had never seen such a device. "A young Bulgarian," she says,

AN UNPROTECTED WORKMAN HANDLING WHITE LEAD.

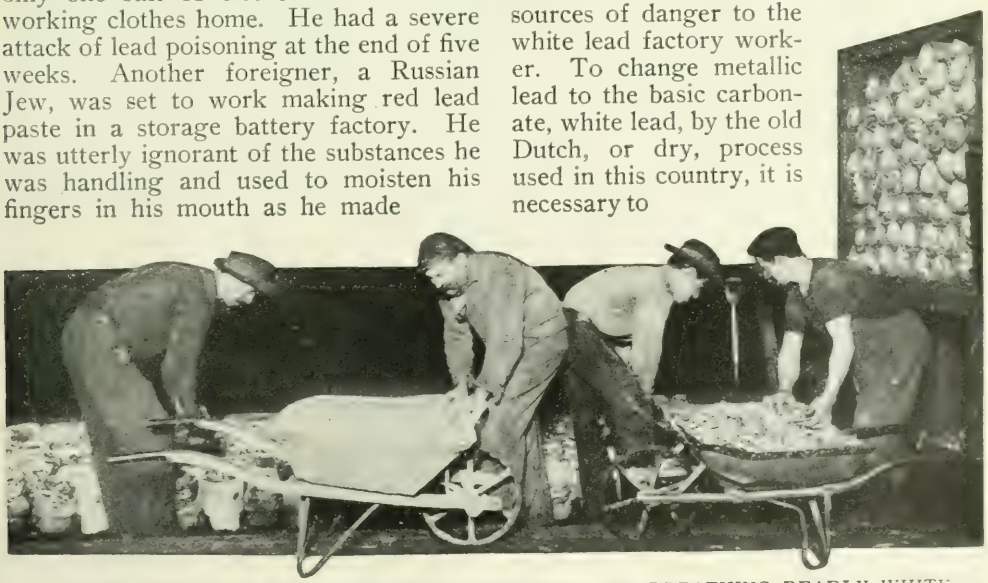
A PROTECTED WORKMAN

"went to work in a white lead factory the first week he arrived in Chicago, and was put to emptying pans of white lead. He was given no respirator and had no idea that he had a right to ask for one. Nobody told him the white dust on his hands and mustache was poisonous. He had only one suit of clothes and wore his working clothes home. He had a severe attack of lead poisoning at the end of five weeks. Another foreigner, a Russian Jew, was set to work making red lead paste in a storage battery factory. He was utterly ignorant of the substances he was handling and used to moisten his fingers in his mouth as he made the paste. He became severely poisoned after ten days' work. We have found almost no effort in the lead works to instruct the foreigners in the care of their persons and in the avoidance of danger."

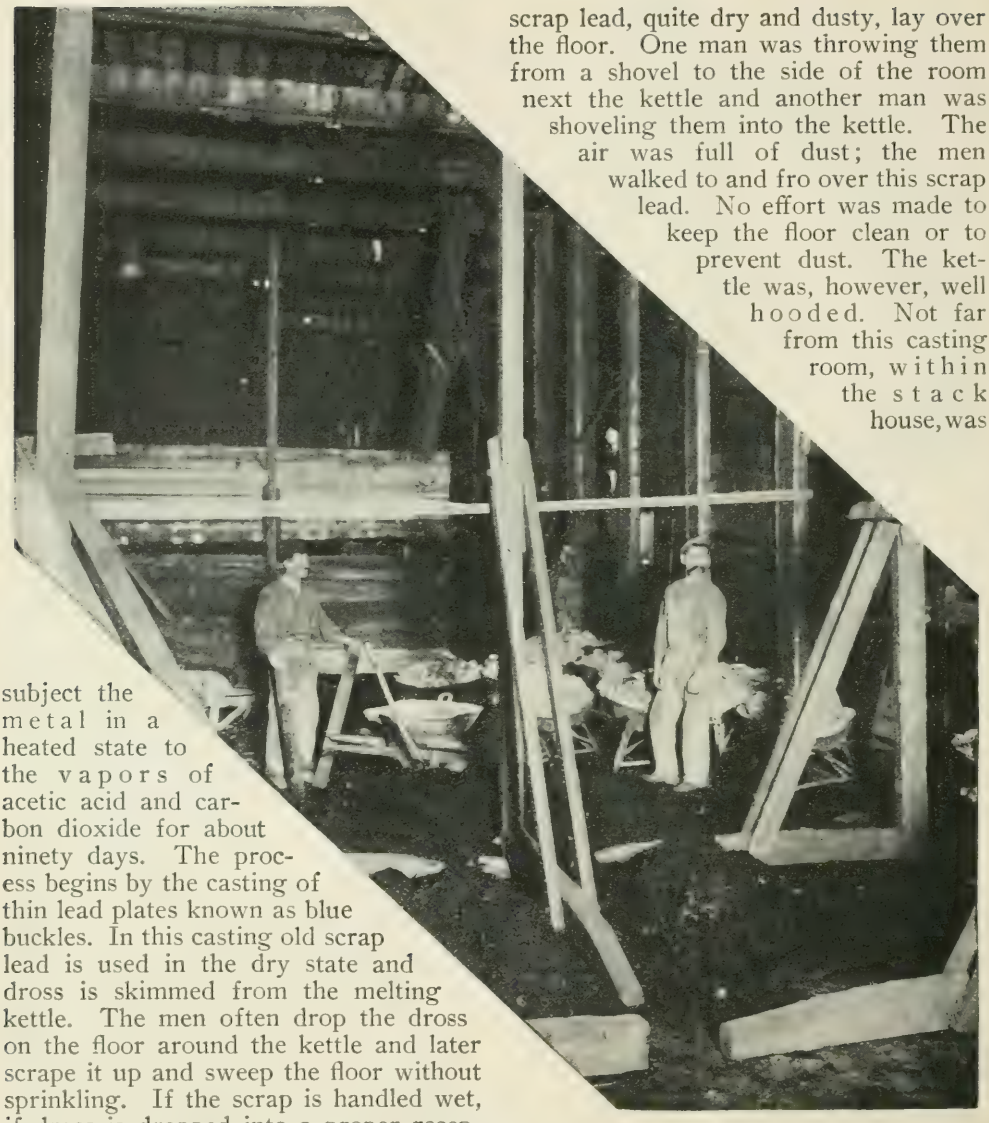
The Illinois law requires a separate room for meals in all factories nor may any workman be allowed to eat in places where there is lead dust. But this has been construed by manufacturers to apply only to regular meals. Foreign workmen accustomed to breakfasting in the middle of the forenoon were found by Dr. Hamilton eating bread or sandwiches while at work, with lead-covered hands.

The men who seek employment in white lead works or lead smelting in this country are regarded as an unsteady, shifting class, and it is true that there is a large army that is continually moving in and out of the lead trades. The reason for this is obvious. Lead work as done in this country today is a very unhealthy occupation and the period of resistance of the average man is less than six months. Some, however, stick to their jobs for the sake of their two dollars a day and are absent only when sick which, in many instances, is about half the time.

And now as to the chief sources of danger to the white lead factory worker. To change metallic lead to the basic carbonate, white lead, by the old Dutch, or dry, process used in this country, it is necessary to



SETTING THE LEAD FOR CORRODING—THESE MEN ARE BREATHING DEADLY WHITE LEAD DUST.



Slacking White Lead.

subject the metal in a heated state to the vapors of acetic acid and carbon dioxide for about ninety days. The process begins by the casting of thin lead plates known as blue buckles. In this casting old scrap lead is used in the dry state and dross is skimmed from the melting kettle. The men often drop the dross on the floor around the kettle and later scrape it up and sweep the floor without sprinkling. If the scrap is handled wet, if dross is dropped into a proper receptacle and not on the floor, and if these are melted only at night when no workmen are in the room, there need be no danger of poisoning anyone, but simple as these precautions may seem, there are many factories in which they never are given a thought. Surely the masters will have much to account for in the day of reckoning, if there be such a day, which they doubtless disbelieve. Here is Dr. Hamilton's description of a casting room she visited:

"It was a small shed in the center of the stack house and therefore without any direct ventilation. Great heaps of scrap lead, quite dry and dusty, lay over the floor. One man was throwing them from a shovel to the side of the room next the kettle and another man was shoveling them into the kettle. The air was full of dust; the men walked to and fro over this scrap lead. No effort was made to keep the floor clean or to prevent dust. The kettle was, however, well hooded. Not far from this casting room, within the stack house, was a second kettle for experimental work. This also had heaps of dry scrap lying about it, and the place was rendered still dustier by the close proximity of an experimental separating machine, which was imperfectly inclosed and allowed dust to escape."

The stack house is also full of dangers to the workman. It is here that the buckles are corroded. Fresh buckles of solid lead present little risk of poisoning to the handler, but unfortunately it is the custom to mix in with the fresh buckles

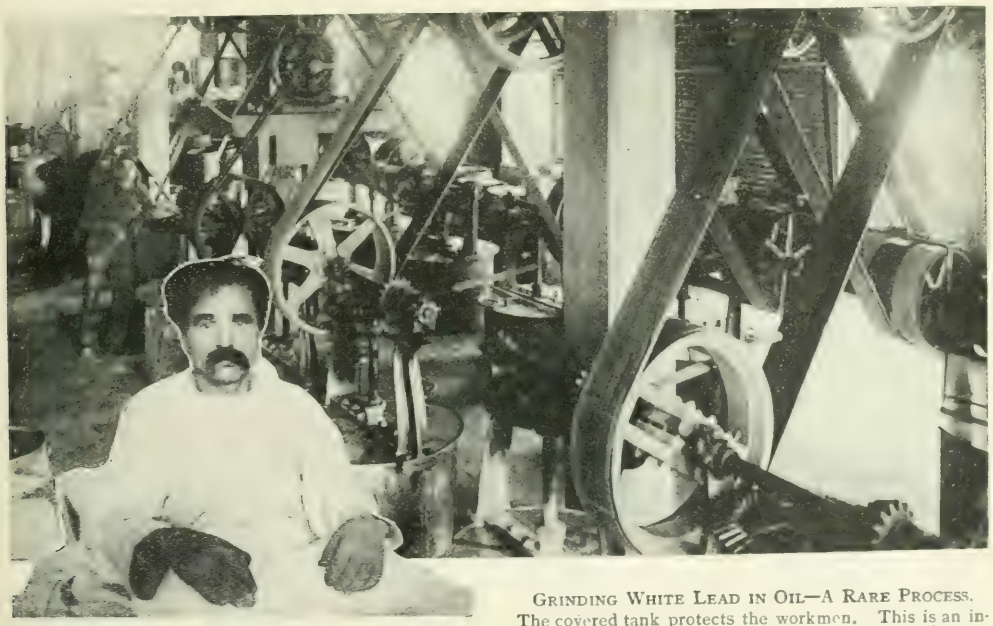
the larger pieces of scrap lead that have not been sufficiently corroded in a former stack. These give off the man-killing lead dust in large quantities when handled dry, but even when damp there is a source of risk unless the men carefully wash the poisonous lead from their hands before eating.

The opening of the ripe stacks, known as "stripping" or "drawing" is one of the worst stages of the process from a hygienic point of view. Pots of white buckles or corrosions must be lifted out and emptied into open wheelbarrows or cars. In our American factories no method has been devised for protecting the workmen who do this from the deadly dust which inevitably arises. In the British and German wet processes the stacks are thoroughly sprinkled, but by the American method the corroded buckles go dry into the separating machine As each pot is emptied, a cloud of dust spreads out, and there are hundreds of pots.

From the stack-house the corroded lead goes to the separator to be crushed to a powder while the particles still uncorroded are removed by screens to be returned to the stack as scrap. It is in the wheeling of the corrosions to the separator that the men are most exposed and also in the removal of the scrap to the dump. The dust, pouring through the vents in the separators and the leaks in the older machines, contaminates the air of the mill save when they are separately housed, which is rarely done.

A lead worker named Lane, 45 years of age, employed in wheeling corrosions in a New York factory, developed paralysis within six months. At first he suffered from "wrist-drop," or loss of control of the hands, then his head dropped forward, and later he was much emaciated by colic. He died of "saturnine toxemia, cardiac asthenia and heart failure." Lane was but one of thousands of victims of the American dry system of white lead making. Every day the heads and hands of some poisoned lead worker begin to droop.

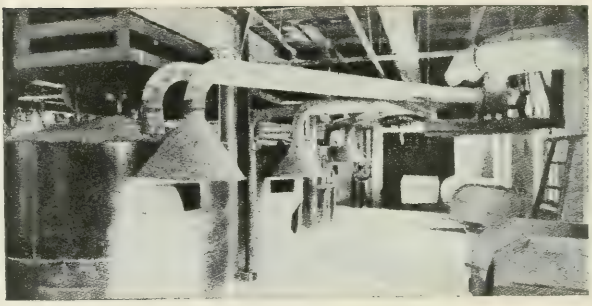
But the deadliest of all places in a white lead factory, as I have found in visits to several of them, is the "dry pan" room. Here the white lead is pumped from settling tubs into great copper drying pans placed one above another. The lead is dried in a hot, closed room. When the pans are to be emptied, the men enter and shovel the dry powder into open trucks or barrels, or openings in the



CASE OF ACUTE LEAD POISONING.
The trouble developed after 5½ weeks' work.

GRINDING WHITE LEAD IN OIL—A RARE PROCESS.
The covered tank protects the workmen. This is an instance where proper precautions have been taken to conserve the health of those employed in this dangerous industry.

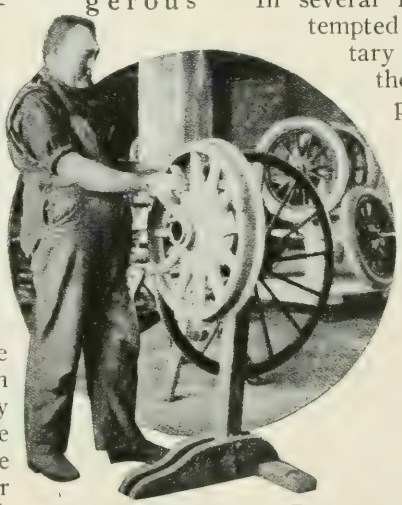
floor. Of course the fine dust rises and spreads everywhere. The men are choked by it, even where respirators are worn. In many places these respirators are not provided to workmen. "They won't wear them if we give them out," say the masters. But Dr. Hamilton and other inspectors have found that where green hands are fully informed of the dangerous character of their work and of the need of keeping the poisonous dust out of their lungs, they will wear respirators if provided with them. This is shown by the fact that in some factories where none are at hand, the men tie rags over their mouths and breathe through them.



CHASER ROOM IN A WHITE LEAD FACTORY.
Dry white lead is shoveled from trucks into the openings under the exhaust pipes, which carry away much of the dangerous dust. In one modern factory the chasers are entirely enclosed, filled by machinery, lighted by electricity, and inspected through glass windows.

So frightful are the dangers of the dry-pan room that in some factories where the reformers have been doing their best work, the managers do not employ their regular help in it at all, but hire outsiders by the day whenever the pans are ready to be discharged.

There are other dangerous places in a white lead factory, particularly the room where the lead is ground in oil. Where the oil-mixer, known as the "chaser," is well covered and there is plenty of ventilation in the room, the danger is slight, but in many factories the practice has been not to cover the machine properly. In one factory inspected by Dr. Hamilton there were great heaps of dry white lead lying on the floor near the "chaser." A man stood beside the machine filling it with white lead from the pile upon the floor. Near him was another man filling small kegs with lead and oil, as much exposed to the flying dust as the chaser man himself. A few of the factory managers who have become interested in the fight against lead poisoning, have equipped the grinding rooms with mechanical means for conveying the white lead from the pans to the weighing hopper and then on to the chaser, which is so carefully covered that there is little danger from dust.



DRY SANDING PAINT IS A FREQUENT CAUSE OF LEAD POISONING.
The operation fills the air with tiny particles of lead dust, which are, of course, drawn into the lungs with every breath.

But the fight begun by the reformers, whose slogan is "Stop poisoning men!" has been productive of far more beneficial results than those already named. Anticipating sanitary legislation which they fear may mean tremendous expense to them, the factory owners, both in and out of the white lead trust, have been falling over themselves to make improvements for the benefit of the health of their employes.

In several factories it has been attempted to standardize the sanitary regulations and devices on the new plan of the carter process factories whose old system has been condemned by the health inspectors. This plan includes the following recommendations printed in thirteen languages for workmen of as many nationalities:

Eat a hearty breakfast before coming to work.

Milk, eggs, and onions are the best food for workers in lead.

Whiskey, gin, wine and beer and other alcoholic drinks are especially harmful to workers in lead.

Do not get lead in your mouth from dirty hands or dusty clothes.

Never carry chewing tobacco in your working clothes or touch it with dirty or dusty hands.

Among the rules posted in these factories are the following:

Respirators must always be worn where there is dust. Shave frequently so that respirator fits snugly.

Before eating and before leaving factory at night, employes must thoroughly scrub their hands, clean their finger nails, and brush their teeth.

Employes must make a complete change of clothing, including hat and shoes, upon coming to work and again at the close of the day's work.

Baths shall be taken daily (on the company's time) before changing to street clothes.

Employes shall report to the company's doctor every ailment, no matter how slight, as soon as discovered and shall be present at the weekly examination.

"It has cost us a lot of money," said the manager of one of these factories to me, "to put in baths and lockers and sanitary devices, but we observe a great improvement in the health of our employes. There is less loss of time from illness and less frequent changes among the working forces."

In its effort to show a healthy-looking set of employes, one white lead company offers milk free at the lunch hour. This same company provided a big bathing room for its men, but few of them would bathe. Instead of resorting to compulsory bathing, it tried various other plans all without result.

"If we can't get them to bathe any other way, let's bribe them," said the manager. This plan was adopted and now after each bath the man taking it receives a ticket good for five cents on pay day.

Hundreds of thousands of dollars are being spent by the trust and the independent companies in these hygienic improvements. This money is being spent so that the present dry system of white lead making can be continued. But it will not avail. There has been no effort at registration of cases of lead poisoning in the United States up to a year ago, and few are kept now, but every inspector knows that if proper records were kept the number of these victims of commercial greed would be seen to be vast.

"Stop poisoning men!" The edict has gone forth and the manufacturers must yield to it. They know that compulsory registration is coming and they are eager to make out as good a case as possible for the dry system. They know too, that there is only one safe way of making white lead and that is by the wet process now in vogue in England and Germany. They know that it would cost them dearly to change their system, so they prefer to adopt sanitary methods while retaining the general—and one might add—criminal-unsanitary dry process. And furthermore they know that after sanitating all their workrooms, the American dry process factory even at its best will remain much more dangerous than the English and German factory.

Where men are set to work to carry out an exceedingly dangerous process, it is little use to bribe them to take baths or to give them free milk. In other words there is no use trying to stave off the inevitable. The dry process of white lead making must go, just as did the use of phosphorus in match making. The fight is on; it will be kept up until the far less dangerous wet process has been adopted in all white lead works.

Surely American industries in which deadly poisons are handled by the carload should be made as safe as they are in other countries. What good to say to the white lead workman, "That is unhealthy work; why don't you get other employment?" He probably would reply as did one young factory operative:

"I know the poison is in my system," said he. "I am holding this job at $15 a week that killed my brother at the age of 39. I wouldn't stay here a week if I had anything else in sight. But what can a working man do? I have a family to take care of, and a laboring man nowadays can't throw up his position and go and take some one by the arm and say, 'I want a new job!'"

But there will be no need of this man or any other white lead worker getting a new job if the reformers win their fight under the banner with that stern device, "Stop poisoning men!"

THREE TIMES TOO MANY FREIGHT CARS

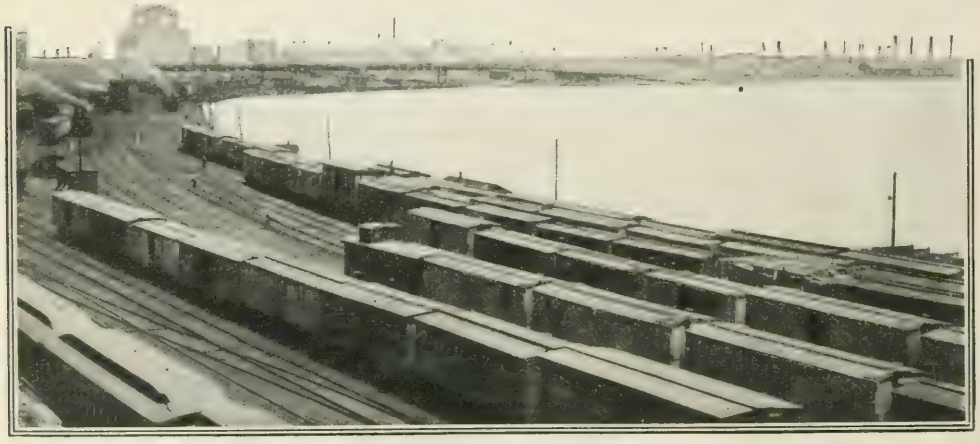
By

GEORGE H. CUSHING

THE railroads own almost three times as many cars as they really need. Yet, ever so often, our business must slow down because the railroads cannot supply cars in which to move freight. We had so great a car shortage in 1902 that business dragged for weeks. We had another—even worse—car shortage in October, 1907, which caused business to slow down for several months. We had another car shortage—the worst of them all—in the closing months of 1912. All of them were wholly needless, for the simple reason that the railroads own three times as many cars as they really need—if those cars were efficiently and properly handled.

It would be interesting to count the cost, if that could be done; but it can't. Every man's business is slowed down a little; what the aggregate would be no man knows. Railroads buy and use and wear out thousands of cars; what that amounts to no man can say. Then, too, these useless cars must have tracks to run—and stand—upon, and engines to haul them about; what that would total in dollars and cents, who can tell? One thing is easily provable—there is astounding inefficiency and actual car shortage, when railroad tracks are congested with needless cars.

All last autumn the public ear was assailed by a lot of sentimental twaddle on the subject of cars. Even the sonorous railroad technical journals and New York financial papers declared, with a measure of finality, that the railroads did not have enough cars to handle the business. This they said was true because the carriers could not borrow the money with which to buy them; they could not borrow the money because political agitation had ruined railroad credit both at home and abroad. The "yellow" papers made the retort that the railroads might have had the money had they not paid it out in dividends. Trying to effect a compromise between these warring journalists, the trade papers arose in wisdom to declare that such car shortages were inevitable because the nation was doing



WHERE CARS ARE WONT TO CONGREGATE.

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THE KEY TO THE CAR SITUATION—THE INTERSTATE COMMERCE COMMISSION.

an unprecedented volume of business, for which no system of carriage could be expected to prepare. The Interstate Commerce Commission, joining in this jargon, arose solemnly to declare that the car shortage was a fact and not a theory and intimated that it would investigate and issue an order or a set of rules which would end the dilemma in short order.

With all this damning evidence and this flow of wisdom arrayed against the lonesome statement of one investigator, I take a stand against the wall alongside one lean, keen railroad man and say there is, and has been, no "shortage" of cars; there has only been distressing and scandalous misuse of them. Get rid of that and you get rid at once of both car shortages and the waste of railroad capital. Out of the mass of evidence that has been presented on this subject, I select the one statement which seems to strike the correct fundamental. It was made to me by a railroad official who, for sufficient reasons, asked that his name be not used.

"The idea that there is, or can be, any real shortage of cars disappears when you but inquire and find what a railroad

car is. It is a vehicle in which to transport goods; it is not a warehouse or a storage shed. Use it only as a vehicle and the railroads can easily do more business with less than half the cars they now own. Use it as a warehouse or a storage shed and no system of carriage on earth can supply the demand for cars. You can see that; anyone can see it."

Accepting that as a sound fundamental, there was yet need to prove it. I must know who were responsible for this misuse of railroad cars and particularly that this misuse was real. After even a few hours of investigation, the proof of misuse was clear and unmistakable. Directing attention to the responsible parties, I found two:

First, the stupid railroad official who sends empty cars needlessly over long distances.

Second, the self-seeking shippers and receivers of goods who use railroad cars as temporary storehouses instead of building cheap sheds of their own.

Railroad men of a certain type will arise instantly to declare themselves blameless. I present these things for their consideration. In one railroad yard in Chicago, two cars were standing side by side. One was an ordinary box car owned by the Pennsylvania Railroad and loaded with household furniture en route from Johnstown, Pennsylvania, to Santa Barbara, California. The other was a clean refrigerator car, owned by the Union Pacific Railroad, empty, and destined to Los Angeles. The Pennsylvania's car was going loaded to the coast but, as far as any one could tell, was almost sure to return empty; the Union Pacific's car was going to the coast to get a load of fruit. The ordinary car could not carry back the fruit but could carry the furniture to the coast. I turned to an official and remarked:

"Those two cars are going West in the same train, aren't they? And, may even return in the same train? Why can't you transfer that carload of goods into that refrigerator car, thus giving it a load both ways and return the empty car to the Pennsylvania, which needs it? I understand that the officials of that railroad have declared that seventy per cent of their cars are away from home, for which reason the shippers over that railroad are suffering for want of cars."

"In the first place," he answered, "the 'old man' wants to keep down operating expense, so we hire cheap roustabouts in our freight houses; you can't trust those bums to handle household goods without breaking them. Knowing that to be true, the shipper will not give us his business unless we agree not to transfer it. We would transfer that and all other stuff regardless, only the Santa Fe tells all shippers it will haul their goods through without transfer. What it does, we have to do or go out of business."

For no better reason than that railroad men could not handle their business properly, a Pennsylvania railroad car, which was sorely needed by a thousand shippers, made a needless trip to the Pacific coast and was away from home purposelessly for about 125 days. With such practices common, is it any wonder that railways, with a superabundance of cars, fail at times to have enough of them to go around?

In another railroad yard, I found twenty "flat" cars loaded with lumber destined to a point 1,500 miles west of Chicago. In another part of that same yard I saw twenty-five grain cars, empty, which were practically going to the same destination. In all likelihood, these two "cuts" of cars would be "made up" into the same train. The grain cars could carry the lumber; the flat cars could not possibly carry the grain. I asked a railroad official the same question—why he did not transfer the lumber since the grain cars must go West anyway. His answer was astounding:

"If I did that, I would have to put on some more help. My station expenses have been heavy as it is and I can't afford to have the 'old man' jump on me for being extravagant."

There you have one railroad notion of "economy." That a station agent's expense might not seem too heavy, the railroad hauled twenty empty cars needlessly over a distance of 3,000 miles. Also, the shippers who wanted and needed those cars must go without them. Again, is it to be wondered at that the railroads with a superabundance of cars quite frequently fail to have enough to go around?

One incident, which came to the surface while discussing this question, in-

volved the Interstate Commerce Commission in a way which indicated that Government adherence to form may prove ridiculous in practice. When the car shortage was acute, a concern in Dallas, Texas, bought a full trainload of telegraph poles from a lumber company in Minneapolis. The natural short line haul on this shipment would have been over the Rock Island lines from Minneapolis to Rock Island, Illinois, and from Rock Island to Dallas. Because the buyer wanted those poles immediately, a special train was made up to carry them and was "red balled;" that is, each car was listed by number and was traced daily by telegraph to make sure that no delay could occur. The officials of the Rock Island's transportation department expected the train to be moved by the short line through Rock Island and, consequently were astounded to find, one morning, that this solid special train was reported as being in the yards at Chicago. An inquiry brought out this explanation from the traffic officials:

"The sum of the local rates from Minneapolis to Chicago, via Rock Island, and from Chicago to Dallas, via Rock Island, is less than the through rate from Minneapolis direct to Dallas, via Rock Island. The shipper elected to ship under the sum of the locals. We had to do as the shipper directed. The Interstate Commerce Commission would not permit us to haul over the short line route and still charge the lower rate which applied on the longer haul, so we had to pull the whole trail from Rock Island and into Chicago and then hitch an engine to the other end and pull it back to Rock Island and from there start again for Dallas. On this account, we pulled a full train 262 miles to fulfill a rate technicality insisted upon by the Commission."

SUPPLYING SHIPS WITH CARGOES.

All the bulk cargo carriers on the Great Lakes could convey 3,500,000 tons each trip and make forty trips in a season, which covers eight months. Why can't freight-car service be, relatively, as efficient?

As any one can readily understand, this kept something like sixty cars needlessly out of useful service for a matter of about ten days. In the light of such circumstances, I can understand why the Northwest, from which those cars were taken, did not have enough cars to carry its grain and coal.

Those three incidents point to one way in which the duller sort of railroad men misuse railroad cars.

Railroad men sometimes keep their cars out of effective service in ways and for reasons that are fantastic, to say the least. Last fall when the whole nation was crying for coal, for example, and

when—because cars were scarce—coal prices were one dollar a ton above normal, I found one case where coal cars were being held in the West and used to haul fertilizer to the barns that would not need it until the following spring. A railroad man asked the western division superintendent why he had used coal cars in winter to haul fertilizer and he answered blandly:

"That shipper is a friend of mine and he wanted his stuff moved. I had the cars that he wanted and gave them to him. Nobody had said anything to me about rushing the coal cars back or about anybody being seriously in need of coal because cars were scarce."

He was asked if he never read the newspapers, and said that he did, "but you never can believe the newspapers."

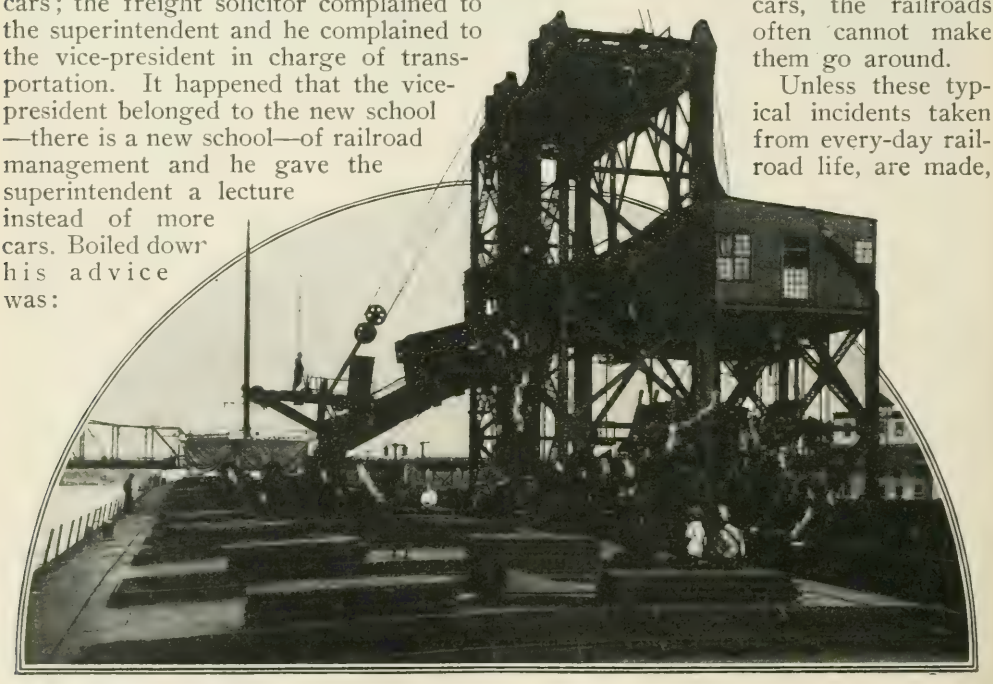
One kind of railroad mismanagement which ends in a car shortage, smacks somewhat of railway technicality but it nevertheless tells graphically its own story. In the Central West, there is one railroad division presided over by an old-time superintendent. Last fall, the shippers over that division complained to the freight solicitor that they could not get cars; the freight solicitor complained to the superintendent and he complained to the vice-president in charge of transportation. It happened that the vice-president belonged to the new school—there is a new school—of railroad management and he gave the superintendent a lecture instead of more cars. Boiled down his advice was:

"What your division lacks is not cars but good management. You say you need more when you could do better work with less cars—if you had a few better yardmasters. Thin out your car supply and move faster those that you have left. You haven't room enough in which to maneuver all the cars you are trying to handle."

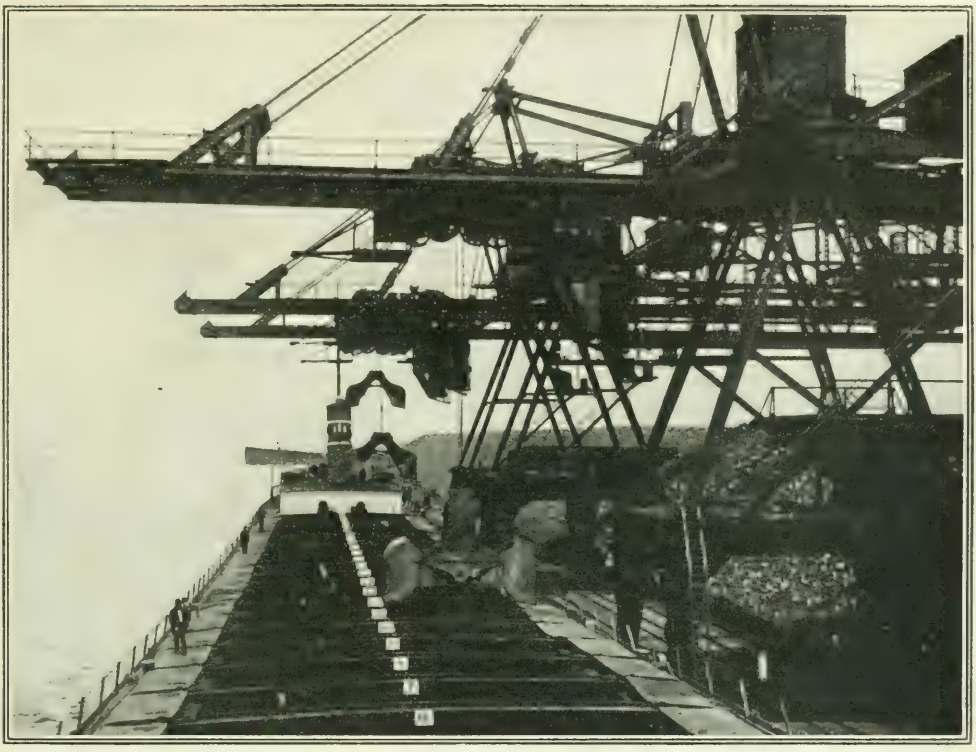
The superintendent took the tip. He reduced rather than increased the number of cars and with only two-thirds the number in use when the complaint was filed, the car shortage was completely removed. That sounds preposterous, but it isn't.

To double the speed of a car doubles its capacity. Taking off one-third the cars and doubling the speed of what is left causes the small number to do one-third more than was done by the original number. That is, you had nine cars in the first place; you took away three, leaving six; you doubled the speed and capacity of six and they do the work of twelve. Railroads by overlooking that fact have bound themselves with their own whip cord. That is still another reason why with a superabundance of cars, the railroads often cannot make them go around.

Unless these typical incidents taken from every-day railroad life, are made,



COAL BEING PLACED ABOARD A VESSEL.
Such a ship as this will carry 185 carloads.



THE UNLOADING PROCESS.
With from three to five such boats as this operating at a port, each day, the movement of cars to that point must be regular.

in the telling, to mean something which they do not mean at all—and that is not the case—the railway men stand convicted. Their carelessness and thoughtlessness cause the car shortages. However, that is only half of the story. The other half was told in a few sentences by another railroad official who also belongs to the new school.

"Considering that railways are public servants and that cars are public conveniences, the manner in which receivers and shippers of goods misuse cars amounts almost to an economic crime. That is, a railroad car as a vehicle is a public conveyance; as a warehouse it is a piece of private property. Thousands of shippers are daily withdrawing tens of thousands of cars from public service and are using them as warehouses; as private property."

This sounded, at first, like a reiteration of an ancient and honorable railroad complaint; all railroad officials will hide behind it when their own position is proved untenable. However, this official had first admitted that railways were, in many things, at fault; he gave this other point only to further elucidate that meaningful suggestion which is now on every up-to-date transportation man's tongue: "A railroad car is a vehicle for the transportation of goods; it is not a warehouse."

"If the railroads are to carry the nation's commerce," he continued, "they must have more use of their own cars. Under present rules and regulations the railroads get to use their cars on the average, only two days out of nine, as I will prove. The average haul of freight on national railways is about 220 miles. To cover that distance in two days, the railroad need only to run their trains across country during six hours a day and maintain a speed of ten miles an hour. That is easy. Under our demurrage rules—rules governing the amount of time a shipper may detain a car—the shippers get practically three days to load

a car; the receivers of freight get almost another three days in which to unload it. In addition, one day is given the shipper in which to reconsign—change the destination of—that car in transit. That means that the car is used as a warehouse for seven days and as a vehicle for two days out of every nine."

At this juncture, business men all over the nation will arise to proclaim the innocence of any wrongful use of railway cars. For their consideration I will submit a few every-day incidents. On one siding in a Chicago yard stood a car loaded with baled timothy hay. The station agent said that it had been there for five days. At that minute the consignee and a prospective buyer came

THE SEASON OF FRUITS AND MELONS.
The delivery by freight is regular, but no railroad official can tell when a fruit car will return home.

along. The latter rubbed some of the hay between his fingers, mumbled something and started away. The broker in hay remained behind. Answering a question as to why he did not unload that hay and release the railroad car, he said:

"First, every man who deals in that stuff is supposed to be dishonest. No one now ever buys hay without inspecting it in the car. If I should put it in a warehouse, the buyers would have to inspect every bale. After they had inspected it, I doubt if they would trust me to deliver what they had selected. You can see where this would lead. If I warehoused my hay and all the others continued to sell out of the car, I would lose all of my business to them.

"Second, property in this neighborhood is expensive. To get a lot big enough for my business would cost about $15,000 and the building on it $10,000 more. The interest on that alone would be $1,500 a year and in addition I would have to pay the cost of unloading. That interest alone would equal the demurrage charges on one car for five years or on five cars for one whole year. What's the use of buying a lot and building a warehouse when you can just as easily hold the railroad car and pay only one dollar a day for the privilege?"

That car had upon it the stamp of the New York Central Lines. At that minute, it was needed in central Michigan to carry sugar beets; in Detroit and Cleveland to carry automobiles; in Ohio to carry grain to market, and in Pennsylvania to carry anthracite coal. In each place some shipper was suffering a contraction of his business and, at the other end of the line, some consignee was going without goods that he wanted. This broker in hay held that car out of service and caused the others to suffer because he did not choose to build him facilities and because hay dealers can't trust each other.

In any of the big fruit markets of the North incidents of this kind may be seen any day in the year. Fruit moves from the South and from California in refrigerated cars. These are moved in solid trains which are left standing in the railway yards. Any morning, fruit salesmen can be seen with their customers walking the well-beaten cinder path between the tracks. The buyer is taken from car to car until he makes a selection. Inquire why this fruit cannot be unloaded into warehouses and sold there, and you get an answer which is the first cousin of that given by the hay broker:

"What? Build a refrigerated warehouse at a cost of $50,000 to keep it iced, when you can get the service of a refrigerated car already iced for two days free and then have to pay only one dollar a day thereafter? Well, I rather guess not!"

Whole trains of these fruit cars thus detained daily in Chicago belonged to the Illinois Central. At the time a Chicago fruit man was making the positive declaration just quoted, I happened to know how sadly shippers along the Illinois Central needed cars. The citizens in one town in western Kentucky about that time memorialized the governor of that State, pleading that he do something to get cars in which they might ship their goods. They told him that their town was being driven out of business and the workmen were starving when they all might have plenty of work and be prosperous if only the Illinois Central would do by them what was fair in the matter of cars.

At about that moment, shippers located at another point along the Illinois Central were winning a big damage suit against that road because it had not supplied cars. And again, at about the same time, the minority stockholders of that road went to the annual meeting with this statement:

"This railroad should spend more money for cars that its earnings might increase. We are losing business and our competitors are getting it merely because we haven't enough cars."

Yet, with all this intensity surrounding the Illinois Central's car situation, the fruit dealers were permitted to hold cars as long as they pleased if they paid but one dollar per day demurrage. When such things can happen, car shortages in the face of car overpluses cease to be mysterious; it merely means that railways simply cannot buy enough cars both to transport and warehouse freight.

An enlightening incident is brought by a railroad man who had charge of transportation in one of the big lumber dis-

tricts in the upper peninsula of Michigan. Cars were short and it promised to be impossible to make the scanty supply go around. The strip of line over which he presided was a busy but small branch railroad devoted almost exclusively to lumber, of which about one hundred cars were loaded per day. He had noticed that the movement of cars was extremely slow and had come to know that this was so because the planing mills insisted upon loading the cars with the lumber as it came from the mill instead of first putting it into piles and loading from the piles. The owners of the mill said that it would have cost more to pile the lumber and then load it than to load the car direct. When the period of car shortage came, the superintendent said to the mill owner:

"You men want cars? You may have them—only on one condition. I am going to give the most cars to the man who loads the greatest number per day. You know what that means; he can load the most cars who will load from stock piles instead of from the mill. You will acknowledge that this is only fair."

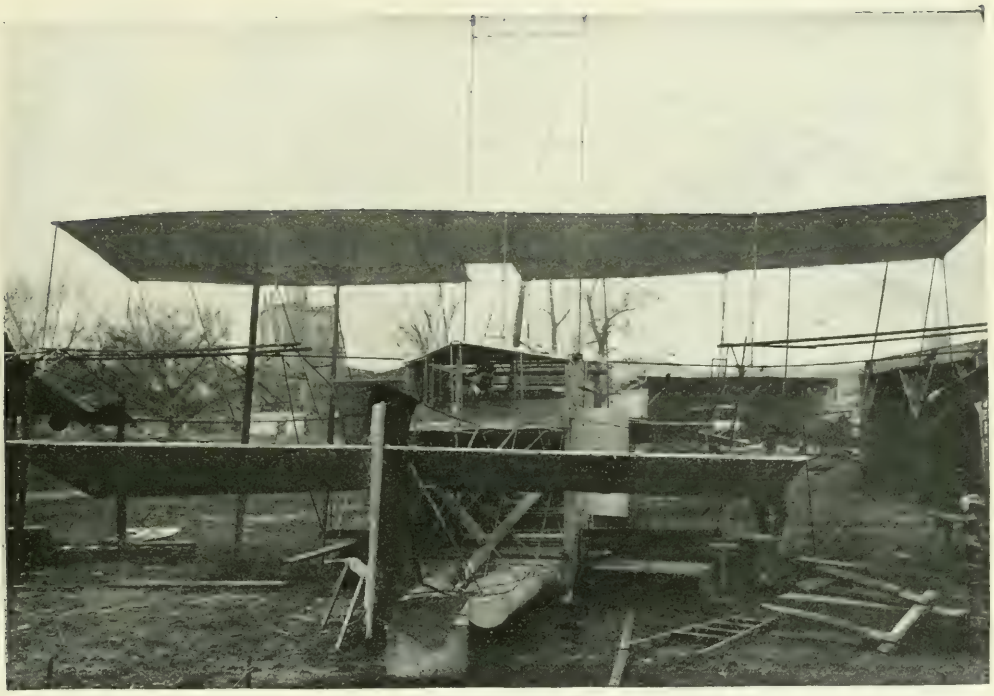
To get the coveted cars, every mill began to pile its lumber. Before this rule went into effect that division had been loading 100 cars; afterwards, it loaded easily 150 cars and in the speed of each car there was an improvement of a little more than one hundred per cent in the movement given those cars. That incident is typical of the thousands of business concerns which daily detain cars that their own expense for handling goods may be reduced. When a railway car may be used as a piece of private machinery to piece out the equipment of a plant, is it to be marvelled at that cars fall short when there is a big need for them?

In the light of these circumstances, I hold that the railroad man spoke truly when he said that, if the railroads could get only half as much use of their cars for carrying goods as the shippers make of them for warehouses, all car troubles would be at an end instantly.

You ask why these abuses cannot be removed? They will be one of these days, but such changes take time and plenty of it. Before that era of railroad efficiency and of business self-dependence dawns, we must first have a great many first-class funerals among old-fashioned railroad officials and we must give business men, by some method of evangelization, a mind to understand that what is their present profit is another's undoing and in the end their own undoing. Such changes are big; they come out slowly in human affairs.

Also, we must needs make over and reform the Interstate Commerce Commission. That body—I have no quarrel with it for it does many good things—not only sees no iniquity in the detention of railroad cars by shippers and receivers of freight, but it actually has promulgated a set of demurrage rules governing this detention. It prescribes that the railroad *must* give the shipper two free days in which to load and the consignee two free days in which to unload a car; also, the shipper *must* have one free day in which to reconsign his car in transit. Thus is legalized and made reasonably permanent the one biggest cause of railroad car shortages.

That much at least seems easy to do; the Commission is a small, compact body which is easy to reach and is open to conviction. However, the thing goes deeper. The courts are numerous; have a constantly changing personnel and follow with almost blind faith, precedents once laid down. And, the courts have drawn very fine distinctions between the services which cars render. The highest courts in most States—the cases are so numerous I do not need to cite any one—have declared flatly and finally that a railroad car when performing one service is a vehicle; when performing other services, it is a warehouse. They have thus recognized the *right*—a legal right—of the shipper and the receiver of goods to use a railroad car as a private warehouse. Under this grant of power by the court, the individual deprives, systematically, the public of its cars and the railroad of its equipment. The upshot of it all is that, when these practices have been carried to excess, we have a car shortage, even though we have in this country almost three times as many cars as there is any need for—if they could be but handled efficiently and properly.



THE "FIRST TRANSATLANTIC AEROPLANE," THE *NEW YORK*, THE LARGEST IN THE WORLD.
This view is from the front, looking through the engine room.

THE COLUMBUS OF THE SKIES

By P. HARVEY MIDDLETON

Nobody knows just how many daring bird men are cherishing the ambition of winning lasting fame by becoming the first to cross the great gap between the continents in an aeroplane. Perhaps half a dozen ocean-going aeroplanes are now actually in process of construction. The death of Melvin Vanniman and his crew, in a trial trip of their huge dirigible, seems only to have made the competition more keen. No less an aeronaut than Claude Grahame White is building, in England, an aeroplane, driven by four engines each of two hundred and fifty horse-power, in which he expects to cross to Newfoundland in less than thirty hours. The present article describes the almost completed transatlantic air-liner of two young American inventors. Whatever may be the fate of these bold adventurers, it is certain that within the next year or two some daring spirit will win for himself a lasting place in history as the Columbus of the Air. One would be almost safe in predicting that the incredible voyage will be safely completed before the end of 1913.—Editor's Note.

EVER since Salmet beat the fastest passenger route from London to Paris on March 14th, 1912, by flying the 222 miles at an average speed of over seventy-three miles an hour, bringing the British and French capitals within three hours of each other, the burning topic of conversation among birdmen has been, "When will the flying machine capture the record from New York to London? Who will be the Columbus of the skies?"

No one acquainted with the recent progress in aviation longer doubts the coming of the Mauretanias of the air. And the future is with the aeroplane, for the lighter-than-air dirigible will not give us that great speed which the twentieth century demands. With our steamships, we can already cross the Atlantic in a trifle over four days, but an aeroplane flying at one hundred and twenty-five miles an hour—a speed which has already been attained—will take us from New

JOHN J. MECKLER, WHO, IN PARTNERSHIP WITH ALLEN CANTON, IS BUILDING THE REMARKABLE AEROPLANE TO CROSS THE ATLANTIC.

York to London in about twenty-four hours. Leaving New York on Saturday morning we could stroll down Pall Mall or the Bois on Sunday. London, Paris, Berlin and Vienna will be week-end resorts, brought almost as near to us as New York to Chicago.

The big fast transatlantic aeroplane—the international Twentieth Century Limited—will mean a swift and regular mail service between New York and Europe every day of the week, and the mail that leaves here on any given day will always reach its destination twenty-four hours ahead of the mail starting on the following day, for these aeroplanes will be so powerful and fast that they will be superior even to the gales. Flying over the ocean will be as safe as money in the Treasury, for the cabin body will be so constructed that it will float the entire machine on the water, if it is necessary, on account of accident, to come down,—the value of this feature of the aeroplane having been amply demonstrated since Wilbur Wright, in his historic trip up the Hudson, slung a canoe under his machine as a precaution against a tumble into the river.

All of which serves to introduce the first transatlantic aeroplane, which has been built by two New York electrical engineers, Allen Canton and John J. Meckler, who have invested all their savings—some $20,000—in the machine, and who are about to bid for fame and fortune in an attempt to reach Europe by the air route. They are not crack-brained enthusiasts, but serious young men who have gained their knowledge of aviation by five years' experience with monoplanes, biplanes, and dirigibles.

Realizing that everything in the continuance of flight necessary for such a journey depends upon fuel and power, they have built a mammoth machine, christened the *New York*, carrying twenty-two tanks of gasoline and five powerful motors. This pioneer Mauretania of the air is 104 feet from the forward propeller to the tip of the rudder, and seventy-six feet from wing tip to wing tip on the main plane, which is a biplane. Altogether there is a spread of twenty-four hundred square feet of canvas, and an estimated lifting capacity of twenty thousand pounds with two of the

five engines running. "We shall be able to run and rest our motors alternately," said Mr. Canton, when the writer visited the "dock" of the *New York* at Clason Point, Long Island, "so that the extra ones will admit of some being under repair all the time. Where you have only one motor you are at the mercy of that single engine. If your engine stops, you've got to come down. We have no such dependence and no such risk."

The plane curves used in this machine are a cross between the Farman and the Wright, being not so much as the Farman, and a little more than the Wright. It is believed by Canton and Meckler—who have practically built the entire craft themselves—that the two main wings will be sufficient to support the whole of the weight to be carried—engines, frame, gasoline, oil and canned food. About fifty-five feet from the nose of the craft, is its central plane, wing-shaped, about thirty feet long by five feet wide. At the rear is a biplane.

In the center of the two main wings is a double mast twenty-four feet high, and where this mast pierces the planes, there is a small hole sufficiently large to admit of one of the men climbing through, if it is found necessary to make any adjustment or to tighten the wires. The whole aeroplane is constructed of special tubing seven-sixteenths of an inch thick, of a soft steel remarkable for its resiliency and flexibility. The wires used are of the ordinary aeroplane variety, of the larger size, and, running from various points, resemble at first glance a gigantic cobweb. The machine itself is built in truss form, the central section being steel tubing three quarters of an inch thick.

There are two small rudders to guide this huge spread of canvas, one, two by four feet at the nose, and another, four by three feet, at the tail. The usefulness of these rudders is augmented by two balancing planes, one on each side of the craft, which, in addition to banking the machine on a curve, also help materially in steering. These balancing planes are so arranged that, in the event of destruction of the rudders, they will act perfectly for steering. They operate automatically to maintain stability, but work in conjunction with the rudders to offset any sudden dip down or up and also to prevent a sudden swerving of the machine when acting at a high rate of speed, if the engines on either side should go out of commission. These balancing planes are five feet wide and five and a half feet long. The inventors declare that they have used these compensating planes on smaller aeroplanes, with perfect results, and they are confident that they will work in exactly the same ratio in the larger craft. "Should either side of the power system become disabled through a suddenly developed flaw in construction," said Mr. Meckler, "or through a shortage of fuel, or failure of the ignition system, the aeroplane will glide along without deviating from its course for several hours."

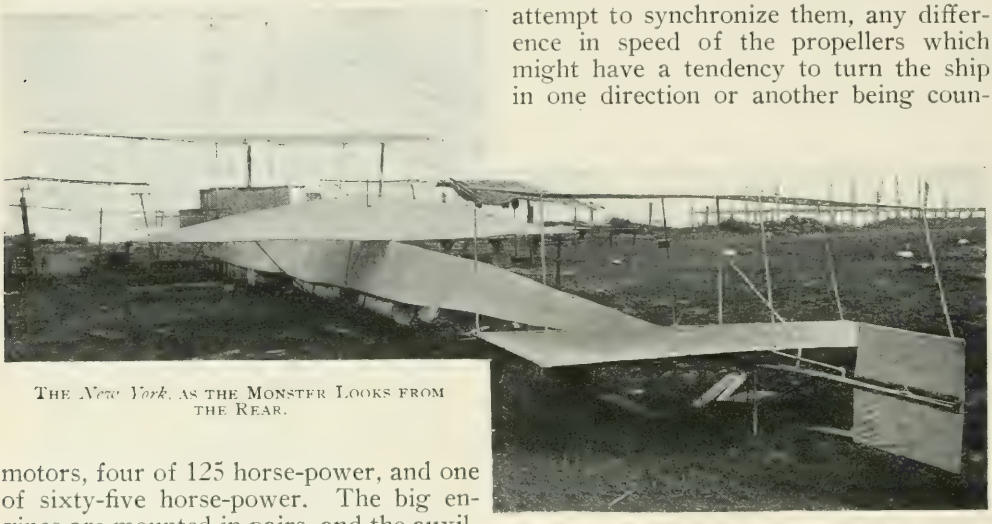
The engine house in the *New York* is certainly the most remarkable so far seen in an air craft. It is six feet three inches high, six feet wide, and twenty-two feet long. The frame is made of aluminum channel rail three by two inches, and is capable of sustaining a weight of over fifteen thousand pounds. On all sides it is covered with a fine wire screen. Over this, to a height of more than four feet, is a permanent waterproof canvas to protect the engines and wireless apparatus.

Here it may be mentioned that the *New York* will carry a wireless equipment, designed by Canton and Meckler, with a transmitting radius of over one thousand miles, using very little current. When not transmitting messages or receiving news, they will use the same apparatus, with the same high frequency currents, in combination with a detecting mechanism, also their own invention, which will show them the location of any ship, derelict, iceberg or other obstacle within a radius of one hundred miles. As their patents are still pending on this invention, a detailed description is impossible here. Another electrical device carried on the machine, for which they have asked patent rights, is an instrument which will indicate their exact geographical position on the ocean at all times of the day, so that it will be unnecessary for them to make observations during the flight. With this device they claim that it will be possible for them to follow a direct line from New York to London.

The roof of the engine house, in addi-

tion to a number of light strong strips of metal, is covered with wire netting, on the top of which is the regular aeroplane cloth. In front of the pilot house are four heavy glass plates, which can be moved in and out, according to the state of the weather. There are two doors on each side of the engine compartment.

The engine equipment consists of five



THE *New York*, AS THE MONSTER LOOKS FROM THE REAR.

motors, four of 125 horse-power, and one of sixty-five horse-power. The big engines are mounted in pairs, and the auxiliary engine is in the rear. Should the ship drop into the water, and the entire plane be broken, it can be used as a motor boat to get into port, the gasoline tanks underneath acting as a float.

There are twenty-two of these gasoline tanks, with a capacity of fifty gallons each. Seven hundred gallons of gasoline will be carried. In addition to this, there are two lubricating oil tanks of eighty gallons each, and one water tank holding fifty gallons. There will be six empty tanks acting as pontoons. The buoyancy of these tanks totals twenty-eight thousand pounds. With the machine fully loaded, and resting on the ocean, it will draw only about three inches of water. The inventors declare that when on the surface, acting as a hydroplane, the machine can make a speed of about 125 miles an hour.

Another feature of interest is the claim that, because of the unusually large surface, the machine begins to rise at a speed of about fifteen miles an hour. The gasoline tanks are built of a light material, and of a peculiar ribbed formation, enormously strong, each of them under test having supported ten men, without buckling. These tanks, complete with valves and fittings, weigh less than nineteen pounds each. As mentioned, they are so connected to the frame that they form pontoons, half of them being carried for that purpose.

The engines are entirely independent of one another, and there will be no attempt to synchronize them, any difference in speed of the propellers which might have a tendency to turn the ship in one direction or another being counteracted by the balancing planes. Each of the main battery engines will drive a twelve-foot propeller with a five-and-a-half-foot pitch, the auxiliary engine driving two ten-foot propellers with two-and-a-half-foot pitch. This will give the craft a driving complement of six propellers and five engines. For the start and for the last few hundred miles of the trip, all five engines will be used. The inventors believe that they will be able to drive the *New York* at a speed of from fifteen miles an hour, with a single engine, up to seventy-five miles an hour with all five engines working to full capacity.

In addition to the buoyancy provided by the gasoline tanks, the bottom of the craft is enclosed in thin sheet metal, forming practically a boat bottom. The two pioneer transatlantic airmen believe that they can cross the Atlantic in fifty-five or sixty hours, driving at a fair speed, about fifty feet above the surface of the water. They are making preparation for only a few days' trip, taking a

small quantity of canned goods, in order to eliminate the risk of cooking in the air. They will be clad in their working garb, with their "glad rags" packed in suit cases for use when—and if—they get to the other side. They figure on starting some time this winter.

If these determined young Americans succeed in crossing the restless old Atlantic, ever tossing in petulant demand for something new since before the days of Columbus, they will by their daring inaugurate a new and wonderful era in the world's history, and in a short time we may expect to see the transatlantic air-liners start from the base of an inclined plane at the Battery in New York, or elsewhere, run up the plane at rapidly increasing speed, and sail gracefully away toward the northeast. And next day we may expect to receive a wireless from London announcing the safe arrival there of the aeroplane passengers from whom we parted only a few hours before.

The idea of constructing aeroplanes capable of flying from New York to London or Paris is receiving active support and encouragement from deep thinking scientists and inventors. If a man can fly over the twenty-five miles of the English Channel, where there are always conflicting and dangerous air currents, as so many aviators have done in the past three years, he can fly over three thousand miles. It all depends upon the comparatively simple machinery of the flying machine. As Claude Grahame White recently pointed out we are getting a better knowledge of air currents every day. Right near the surface of the earth the direction of the wind is continually shifting. One day in a given place it will be blowing in one direction, and in another the next. But in the higher altitudes that is not so. There are air currents in the sky just as fixed and immutable as the Gulf Stream itself. The air strata above the Atlantic ocean have not been charted yet, but they soon will be. When the airship of the future starts on its transatlantic journey, it will rise to the proper altitude and take advantage of the trade winds of the sky, flying along in a zone of perfect safety till the other side is reached, when it will come down to the water and proceed to its landing place, just as the steamship does today.

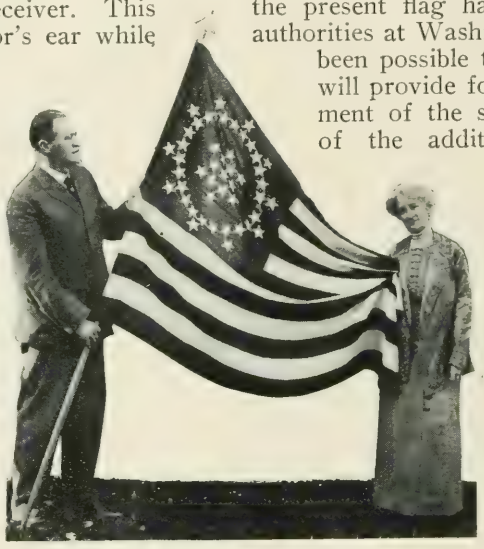
There are a number of important items in the *New York's* equipment which are innovations so far as airships are concerned. For instance, the craft will have a searchlight of ten thousand candlepower, with electric lights all over the engine room. A telephone will enable the two operators to communicate with each other.

Canton and Meckler are known in the inventive field as the inventors of a phonograph using paper as a record, which can be folded and mailed; of a telautograph apparatus; of signaling and controlling systems for railroads, and also of monotype casting machines.

HEARING THE ENGINE'S HEART BEAT

SIMILAR to the use of the stethoscope for testing irregular heart action, is the device in use in automobile plants for detecting the slightest uneven action in the running of an engine. This instrument consists of a steel rod of three parts, at one end of which is attached a telephone receiver. This is held at the operator's ear while the free end of the rod is placed on the motor while it is in action. In this way "valve slaps" or irregularities of any sort can be heard and located and the trouble corrected before the engine leaves the works.

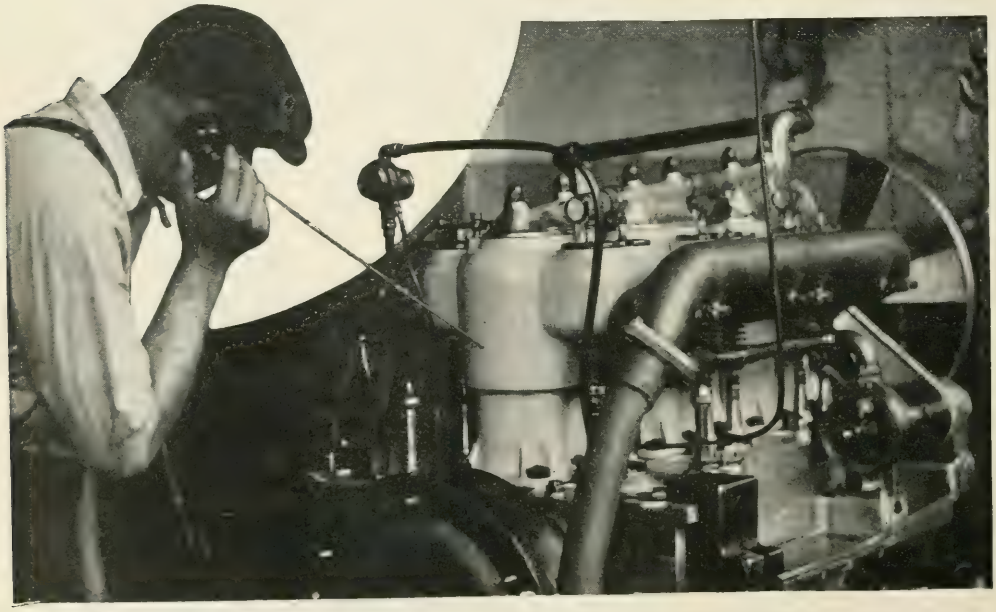
The apparatus is one that will prove of great value to automobile engineers. The number of things that may go wrong with an auto's engine is, of course, great.



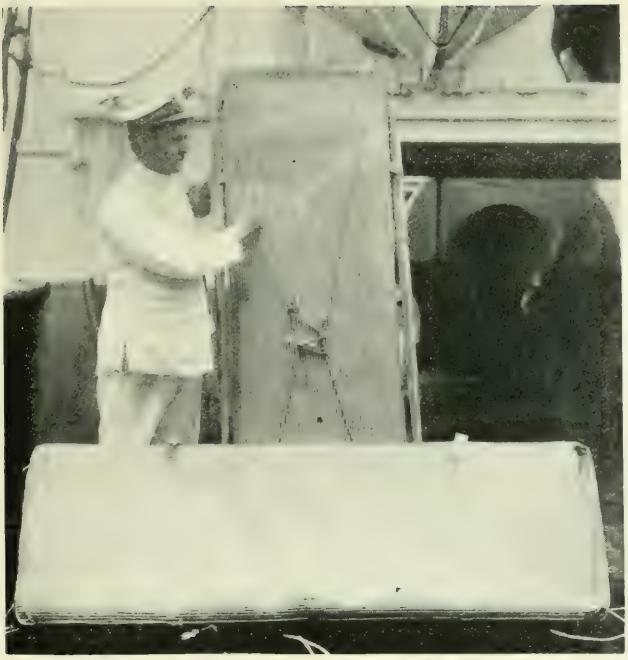
WHAT OUR OFFICIAL FLAG MAY LOOK LIKE.

REARRANGING THE STARS

WAVING in the breeze over one of Germantown's old mansions is a flag that attracts the eyes of all passersby. It is the new flag designed by Wayne Whipple, the historian, and it is probable that it will some day be adopted as the official flag of the United States. The crowded and inartistic field of stars in the present flag has long troubled the authorities at Washington, but it has not been possible to design a field that will provide for a suitable arrangement of the stars and still permit of the addition of more stars as new States are admitted. Mr. Whipple's design makes this possible. President Taft invited Mr. Whipple to the White House, saw that the design for the rearrangement of the stars was a good one and referred the matter to the War Department, the proper authority in such matters,



DETECTING TROUBLE IN AN AUTO ENGINE BY STETHOSCOPE.



THE PARTS OF THE RAFT.

and the War Department expressed instant approval of the new design.

The arrangement of the stars illustrates the history of the United States. The thirteen stars in the center, placed in the form of a six-pointed star, stand for the thirteen States which first combined to form the United States of America. This arrangement of the stars is on the authority of the seal of the United States, the Coat of Arms and the President's Flag.

The circle is composed of twenty-five stars, standing for the twenty-five States admitted to the Union during the first hundred years of our history—from 1776 to 1876. Washington is the authority for placing the stars in a circle. In the first flag designed by him and made by Betsy Ross there were thirteen stars set in a circle.

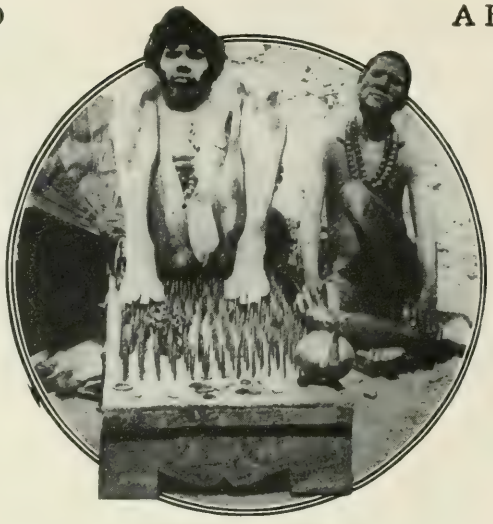
Outside the ring of stars are ten other stars for the ten States admitted to the Union since the Centennial Year, 1876, including Arizona and New Mexico, which came in last year, making forty-eight States.

The present flag contains the forty-eight stars in six rows of eight each, and it is impossible to add more without making the stars smaller and the design clumsy. The arrangement suggested in the new flag makes it possible to have larger stars with a stronger and more distinct design. The central design need never again be changed, the addition of stars being made outside the circle, which ten stars can be added to at will as the new States come in with the growth of the nation.

A MATTRESS AS A LIFE-RAFT—PUTTING AWAY FROM THE SHIP.

This mattress can be made to fit a bed or bunk. It can be carried easily and may be thrown overboard, with a line attached, so that persons may be lowered to it. This device was one among the more important life-saving devices for use on shipboard that were brought before the Army Board on life boats and life-saving apparatus recently, at Newport. The invention is that of Lieut. S. P. Edmonds, a retired officer of the United States revenue cutter service.

SELF-INFLICTED TORTURES

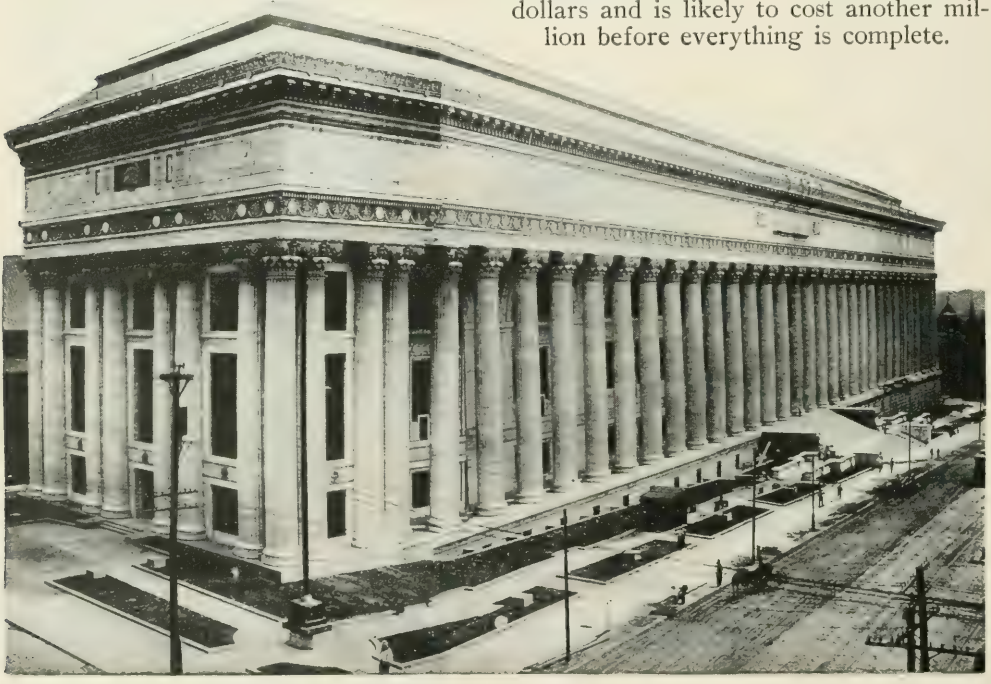


SELF-TORTURED IN ORDER TO GAIN ALMS.

THE ascetics or religious fanatics common to India perform the most extraordinary feats of self-inflicted torture, in order to claim the attention of the passer-by from whom it is hoped a contribution will be secured. The beggar on the left sits on a bed of sharp spikes, all through the day, in the glare of the Eastern sun. His assistant on the right practices self-denial and will abstain from eating for three weeks at a time. His face is painted to make more patent the sorry conditions resulting from his long and terrible fasts. This would seem to be a most arduous way of making a living.

A BEAUTY AMONG BUILDINGS

THE new Educational Building at Albany, N. Y., was dedicated recently. It is regarded as one of the most beautiful buildings in the world. Its exterior is of gray granite, white marble, terra cotta and light-colored bricks. In the basement are store rooms and the beginning of a two-story auditorium with a seating capacity of 900. On the first floor are administrative offices. On the floor above is a great vaulted corridor leading to a reference reading room. There are also medical, law and legislative libraries and a periodical room. Between the stone columns of the rotunda are steel filing cases. The building has cost five and a half million dollars and is likely to cost another million before everything is complete.



THE NEW EDUCATIONAL BUILDING AT ALBANY, N. Y.

WATCHING A GAME OF BASEBALL IN FRONT OF THE ARIZONA STATE PENITENTIARY AT FLORENCE.

CONVICT ON HIS HONOR

By

RANDALL R. HOWARD

THE Superintendent of the Arizona State Prison at Florence was one day called to the long distance telephone to receive this strange message from Phoenix.

"Send Bob Anderson to the Capitol on the next train—this is Hunt speaking."

Now Bob Anderson was a reputed bad man, and the Prison Superintendent was revolving in his mind whether he had any guards that could be spared to accompany the prisoner. But the suspense was soon ended.

"Give him a ticket, and some money—*and send him alone,*" the voice continued. "Tell him I want to see him at the Governor's office."

The life-time convict was very ill at ease when he arrived alone at Governor Hunt's office, several hours later.

"I want you to go up on the Verde and get the prison team," the recently-elected Governor announced, after Anderson's suspense had been relieved by some pleasantries. "The horses are in a pasture way up there in the mountains, costing the State eight dollars a month—while out at the prison we are paying out between thirty-five and forty dollars a month for another team to replace them."

The arrangements were soon completed. Anderson was provided with a

SUBLIMITY HONOR CONVICT ROAD GANG AND THEIR WELCOME TO GOVERNOR WEST OF OREGON.

ticket to go as far as he could by train. Then he was given money to buy groceries, for he was starting on a week's journey out across the lonely desert and up into the wild rough foothills at the edge of the timbered mountains.

It was not long before the newspapers got hold of this scare-head story—this most rash act of the new Governor in releasing, scot-free, a convicted murderer who hadn't been outside of prison walls or beyond the fire of a dozen riflemen for years. The Governor's closest advisers deplored what he had done, and the opposition newspapers hinted that the Chief Executive must be either insane or secretly conniving. At the very best, the opposition boldly declared, the Governor was sorely tempting the convict—donating him money, provisions, and the use of two of the State's horses, and thus equipped, sending him off alone into the wilderness.

The week wore around—and Anderson came back with the team, to his lifetime prison cell. Arizona, which has a larger proportionate prison population than any other state in the Union, has learned its first lesson in the application of the radical and bold "honor system" among convicts.

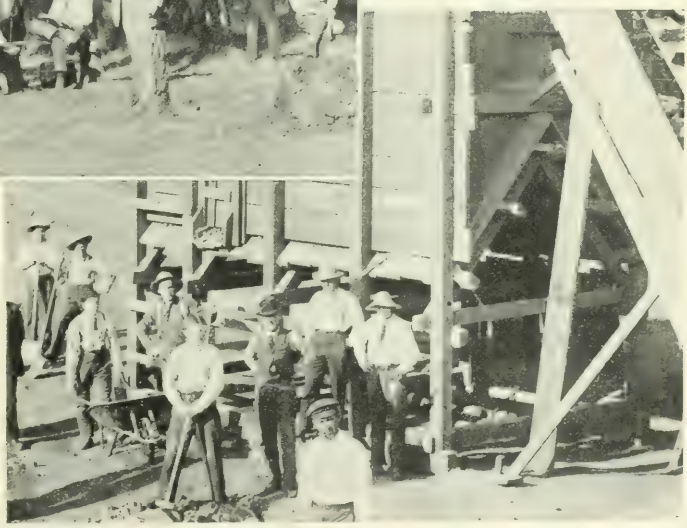
Lesson number two was not long in following. Another Arizona State prison inmate, a convicted forger, was released "on his honor" for a month's time, and given enough money to carry him to Washington, D. C., that he might file patents for several of his inventions. The Governor assumed responsibility again—but before the month came to an end Roy J. Meyers had voluntarily returned to his prison cell. Another prisoner was allowed to make a trip to see his family—and he also came back. A banker friend of the Governor's was still critical of the new prison "honor system," so when a certain convicted forger was discharged after his prison term, the banker sent him a bill for a formerly-forged check. The next mail brought back currency to the amount.

One might add instances from other reform State prisons that have adopted the "honor system." In Oregon, Governor West learned that the shoe shops in the State prison at Salem had out-of-date equipment. So the Governor called up the prison one day and requested that

WALI CLUB AT SUBLIMITY, ORE. ENTERTAINING GOVERNOR WEST AND HONOR MEN.
The governor is seated at the head of the table at the left.

DOESN'T LOOK MUCH LIKE A CONVICT GANG?
Governor West makes a call at the camp.

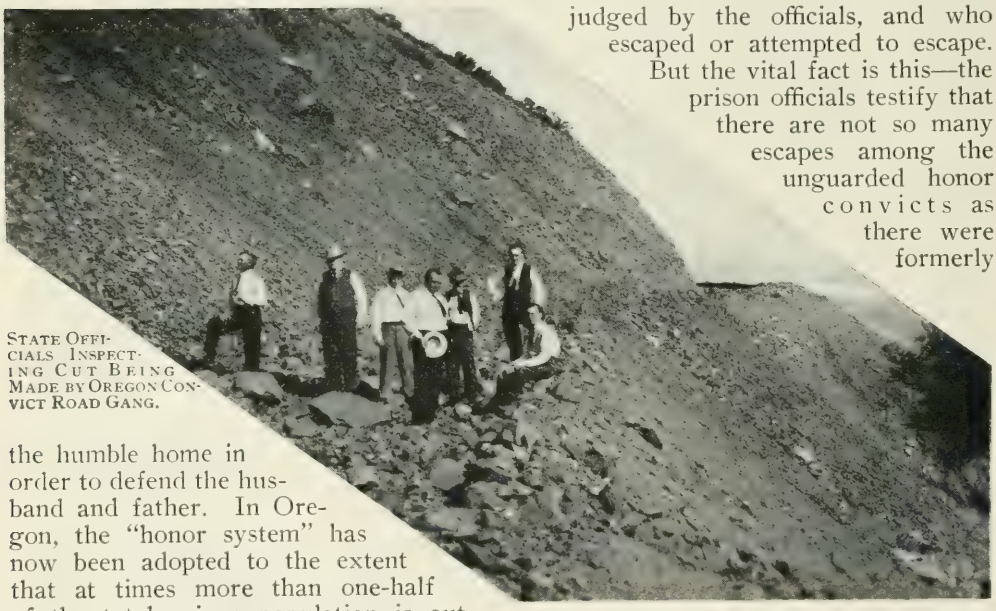
a certain life-termer be sent down to his office, without guard. The warden at first protested, but the convict came. The Governor merely talked with him for a few minutes, then sent the convict out to see



CONVICT GANG AT WORK IN A QUARRY IN MARION COUNTY, OREGON.
These are honor men and give little more trouble than would a crowd of ordinary workers.

the town for an hour. At the third visit the Governor explained why he wanted to get acquainted. The prisoner was given money to go to Portland and buy new shoe-shop machinery in the name of the State. It was Rose Festival week in the Oregon metropolis, and the city was crowded with visitors. But "No. 3615" completed the business and returned to his life-time prison cell.

A second life-timer, named Mack, was released by Governor West for six months to make money to pay off the mortgage that the family had placed on the humble home in order to defend the husband and father. In Oregon, the "honor system" has now been adopted to the extent that at times more than one-half of the total prison population is outside the prison walls without guard. Road-making has been one of the chief occupations for these released honor prisoners. For instance, one large crew worked for months making a new highway between the various State buildings and farms. Also, another honor crew was sent out into the heart of the rugged Cascade Mountains, to work on a road to Crater Lake National Park. This road crew was up in the mountains for weeks without guards, miles from the nearest farm residence and railroad stations. Their deportment was perfect, but for the fact that three members of the crew became disgruntled because they disliked to be "bossed" by the convict sub-foreman, and deserted camp and started to walk back to the prison—after having previously written their plans to the Governor.



STATE OFFICIALS INSPECTING CUT BEING MADE BY OREGON CONVICT ROAD GANG.

Of course not all convicts are presumed to have the moral stamina to respond to the "honor system." For instance, in the early days of the trial of the new system at the Oregon State Penitentiary, Jesse Hall broke parole, stole a horse and armed himself and started for the mountains. The young Governor was so much concerned that he lead a posse, and himself recaptured the convict at the point of a shotgun. There are plenty of examples of honor convicts who have been misjudged by the officials, and who escaped or attempted to escape. But the vital fact is this—the prison officials testify that there are not so many escapes among the unguarded honor convicts as there were formerly among convicts that were very closely guarded.

In the words of Governor West: "We are now pretty well able to sift out the real criminals, who should be kept locked up away from society. The other men—really not criminals at heart—should be given another chance."

Superintendent Sims, of the Arizona State Prison, recently said, also, to the writer: "The first impression that one gets in coming here and studying without prejudice the prison population, is that there are so many men here who ought not to be here, and so many men who ought to be here that one doesn't find. I would sooner, a thousand times, trust my children with some of the men

here, than with some of the men whom I know who are not here."

The first steps in the introduction of the new prison "honor system" in Arizona and in Oregon are interesting. Governor Hunt demonstrated his seriousness by spending a night in a prison cell, and Governor West constantly surprised the officials by unexpected visits, to see the convicts at work and to share prison meals.

The new prison "honor system" has brought a radical change in attitude toward convicts. "The prisoners used to be treated like cattle," to quote an official. "They were tolerated and prodded about. They were driven to their cells at night, and their feed was poked to them. Hence all of the manhood was either cowed out of the prisoners; or else they were made surly, and a premium was placed on their escape."

Now, in these same prisons, there is an atmosphere of hope. Every man, who is not a moral pervert, is anxious "to make good," to become an honor man. Moreover, ambition is awakened. For example, the inmates of the Arizona State Prison have organized a "Mutual Improvement League," which has provided self-government, has organized a variety of practical study classes, and is now at work collecting a business reference library, etc.

"The hardest people we have to deal with," said a prison official, "are the justices of peace, and the sheriffs and police outside. They trail and tag a prisoner after he gets outside; and if they are hunting for a criminal, and find a man who has a prison term to his discredit, they stop right there. Our prison 'honor system' presumes a new state of mind, on the part of the public, toward the morally deficient men whom we are trying to cure."

Patience is the key of Paradise.

Peace with a cudgel in hand is war.

Storms make oaks take deeper root.

The older the blood the less the pride.

SELLING LAND FROM A BALLOON

LOS ANGELES is known as the home of the enterprising real estate agent and probably no feat performed elsewhere in the line of selling lots has been equaled by the exploit of one of these Angeleños. He had almost convinced a prospective customer of the merits of a certain out-of-town lot but the prospect demurred at signing a contract without seeing the property for which he was expected to pay out his good money.

BALLOON VIEW OF LOS ANGELES, ONE THOUSAND FEET ABOVE THE CITY.

It was a little too late in the afternoon to go out, and besides the company's automobile was in use, but it would never do to let the customer get away, as he might change his mind or see some other agent.

The salesman had a big idea. A captive balloon makes frequent ascents from a lot just a few blocks from the office, rising to the end of a thousand foot cable and carrying passengers at $1.00 a trip.

With a little urging the customer was induced to take the aerial journey, and from that altitude the agent pointed out the suburban lot showing its exact location and the character of the surrounding property quite as clearly as if they were actually on the ground.

Before they descended, the prospect had agreed to buy the lot and the agent did not even have to threaten to throw him overboard if he balked at the contract.

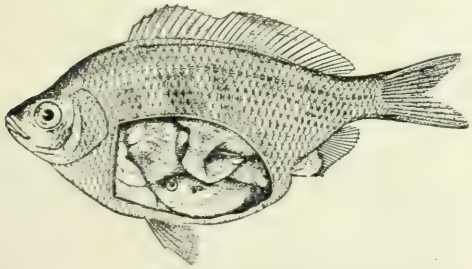
MOST DARING OF CLIMBS

J. E. KILLIAN, a steeplejack, recently put a coat of paint on the flagstaff on the top of the government's new wireless tower at Arlington, Va., the tallest wireless tower on earth. Killian, who is but twenty-four years old, is the only man the United States government could induce to mount to the top of the staff and paint the pole which flies the American flag today. He succeeded in getting Arthur Baily, a young Virginian, to accompany him. But at 600 feet, the base of the flagstaff, Baily stopped, and declined to go further. Killian went to the top of the 35-foot staff above.

S. E. KILLIAN—"CARENOT" KILLIAN WITH ARTHUR BAILEY, THE ONLY STEEPLEJACK WHO VENTURED TO ACCOMPANY HIM ON HIS 635-FOOT CLIMB. BAILEY DID NOT GO UP THE STAFF.

The photographs shown are the only ones—except the official ones which the War Department holds for its own use—ever made of the towers and the men at work on them from a close view.

Killian does not seem to regard his extraordinary climb as so very remarkable. He says that it is merely a matter of keeping a cool head, which is advice not easy to follow.



THE WHITE SURF FISH A FREAK AMONG FISHES.

FREAK AMONG FISHES

ALMOST singular little fish, which, instead of laying eggs or roe, gives birth to fully developed young, is found along the California coast. Specimens collected by members of the United States fish commission July 1 were stuffed with little fish apparently almost to the bursting point. In some instances the young had begun to escape from the mother, the little ones being found in the water and in nearly all cases they could be easily pressed from the body of the mother, in which event they were able to maintain themselves in an upright position in the water and swim about. The adult fish are a silvery white color from 3½ to 8 inches long and the newly born fish were from 1 to 1¼ inches in length. "Surf fish" is the name it goes by, and it is described by the fish commission as swarming in great numbers, during the

spawning season, in the surf or in shallow water along sandy shores.

Every haul of the seine resulted in the capture of great numbers of them.

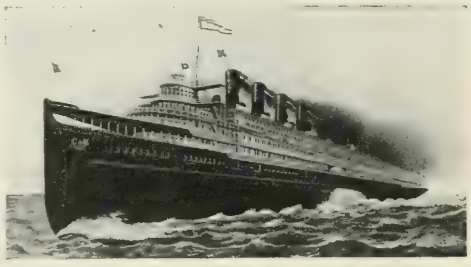
ONE OF THE TWENTY TONS A DAY OF CONGRESSIONAL MAIL.

LARGEST SIDE-WHEELER AFLOAT

THE largest side-wheel passenger steamer in the world, the *See-and-Bee,* was launched recently in Detroit. Beginning with July 1 it will plow the waters of the Great Lakes. This vessel is considered the last word in marine architecture. Her length over all is 500 feet.

The furnace is the largest ever put into any steamer on the Great Lakes. Her speed will be twenty-two miles an hour, and she will have 12,000 horsepower.

She will be able to carry 6,000 passengers. Her freight capacity will be 1,500 tons. There will be 4,500 electric lights on board, and a telephone service connecting every part of the ship. For fire alarm purposes, the vessel has been divided into 50 sections.



See-and-Bee OF DETROIT, THE HUGE SIDE WHEELER WITHOUT A PEER.

The lobby will be as large as that of an ordinary hotel. The hull is constructed entirely of steel, with a double bottom.

There will be sleeping accommodations for 1,500 persons.

ODDITY IN ADVERTISING

A PRINTER in Birmingham, Ala., made an unfortunate move, taking quarters upstairs, where his former patrons failed to follow him. On discovering his mistake, he promptly sent out letters like the following, upon very attractive stationery, addressing nearly every business man in the city:

"Dear Sir:

"Enclosed find check for two cents to pay for one minute of your time. I wish to say that you will find me with an electrical printing outfit of the latest pattern at —— ——, ready to do better work for you than ever."

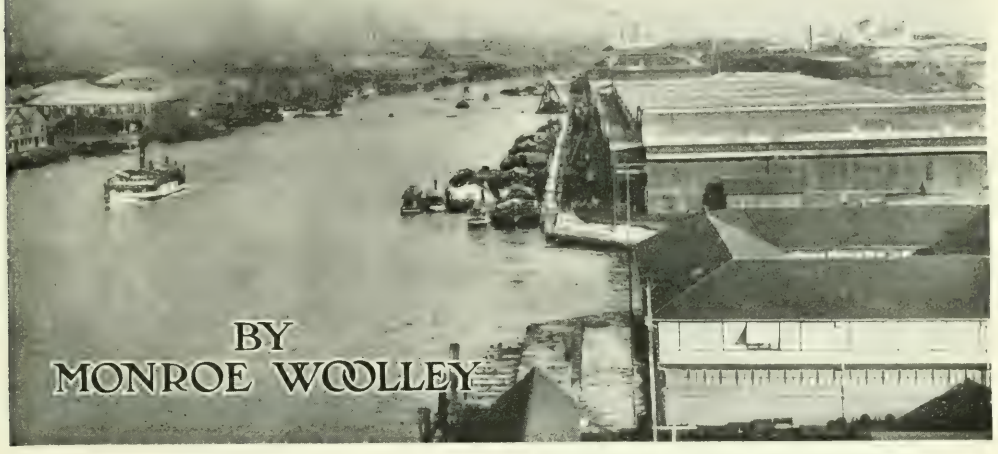
The checks were perfectly good and cashable at the leading bank, so naturally each held the recipient's attention for more than the one minute requested though none was presented for payment. But most of the old patrons responded, and enough new business came in to set his wheels a-humming.

"POSTAGE FREE"

EVERY day, during sessions of Congress, there leave Capitol Hill in Washington twenty tons of material that is franked through the mail by Congressmen. The great bulk of this material is printed matter sent out to constituents. The government printing office expends five million dollars a year in preparation of government documents, the great mass of which is allotted to Congressmen, and mailed, postage free, to the folks back home.

In each of the office buildings of Congress, one maintained for senators, the other for representatives, there is a commodious postoffice. Attached to each are what are termed folding rooms. Here great numbers of employes are steadily at work folding documents, addressing envelopes and attaching congressional franks. As fast as the material is ready it is bundled into bags, piled upon wagons and hurried away to the Washington postoffice.

MAKING MANILA A PRIZE PORT



BY
MONROE WOOLLEY

HIGH on the list of achievements which must be written down to the credit of the United States is the great engineering work which has transformed the old, Spanish port of Manila, with its shallow water, utter lack of landing wharves and dangerous reefs and sandbars into the most modern, convenient and safe harbor in the Far East.

Although Manila is only a short distance from Hongkong, Shanghai and Singapore, which ports, in the order named, rank among the twelve greatest seaports in the world, the Spaniard in his day never did much to improve the big bay where our navy cut a colossal figure eight, and somewhat of a swath besides, a little more than a decade ago.

Up-to-date ports, as seems to have been the case with their navy, was not one of the things the dons were over-enthusiastic about. When our transports carried over the first military expeditions, they found that discharging troops and ordnance equipment from the ships took about as long as it did to steam around Luzon. There were no wharves at all. It was possible to moor ships of light tonnage along the walled-up banks of the Rio Pasig, but the big transports could not crawl over the bar at the mouth of the river or navigate in the shallow stream, after negotiating an entrance.

For decades, even centuries, hemp, rice, and other products the Philippines exported to the four corners of the earth, had been lightered in lorchas or cascoes, —native types of barges,—propelled by men with poles and paddles, or towed by steam launches. These barges were brought alongside the ships, at anchor far out in the bay, to receive the shipments. Often storms came up, wrecking the cascoes before they could get their stores into the Pasig. Altogether the method was a slow, costly and uncertain process of discharging a vessel. About the only persons benefitted by the antiquated system were the stevedores, who owned most of the launches and lighters. These cumbersome methods prevailed up until a very short time ago.

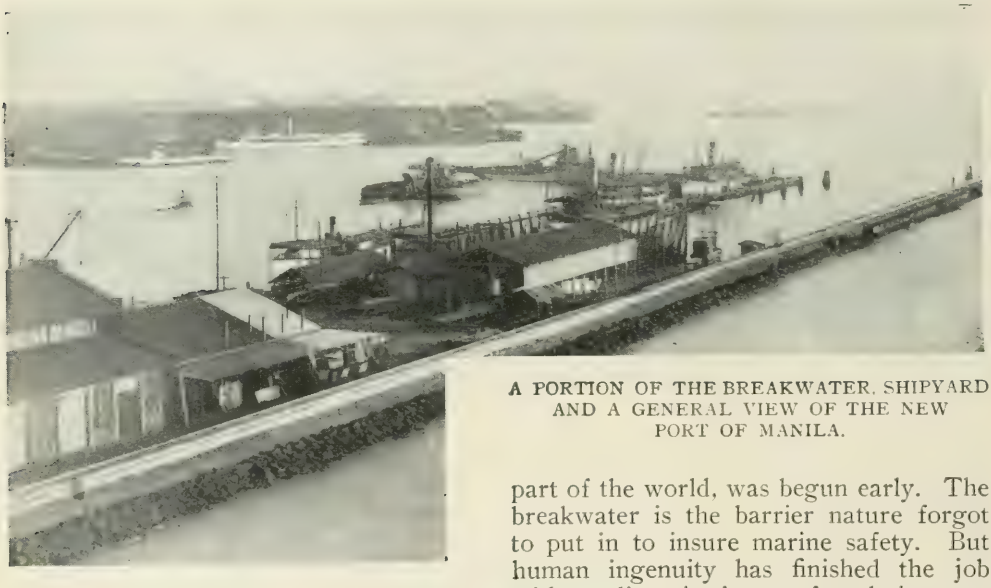
The first step of importance in improving Manila's great bay, where the combined navies of the world could muster and maneuver at will, was a task Nature left unfinished—that of making a safe

harbor for ships of all sizes and kinds at the foot of the broad, unprotected bay.

So a reclamation project covering an area along the old bay-shore of nearly two hundred acres was first undertaken by the government. The contractors put big hydraulic dredges, as powerful as the biggest freighters and as elaborately equipped for comfort as many passenger steamers, to work dredging out a basin for the protected harbor. These dredges, working night and day, dipping up sea-bottom in buckets on endless chains to the extent of thousands of cubic yards daily, forced the mud and rock from their positions, far out in the bay, through long links of pontooned piping to shore. While the machines deepened the bay, they automatically filled in the area to be reclaimed. This took time. But, in a few years, where sea-going vessels once rode at anchor, now modern buildings stand.

The fill was made just in front of the Luneta, the city's seaside park and drive. For that reason it is called the Luneta extension, and from it an automobile boulevard, skirting the beach, is to run around the bay to Cavite, more than a dozen miles away. But then this is another story. The extension, which two years ago, was a slough of sea-slime inclosed within riprapped sea walls, is now covered with a velvet lawn on which the leading club houses, all of reinforced concrete, stand. Acting as a sort of hub for the club center is the new hotel, costing more than a million pesos.

Of course it was necessary in dredging out a harbor to adopt some means to prevent the action of the sea from filling up the excavations. For that reason the breakwater, itself one of the cleverest engineering feats ever attempted in that part of the world, was begun early. The breakwater is the barrier nature forgot to put in to insure marine safety. But human ingenuity has finished the job with credit. A riprapp foundation was first installed, and that part of the sea-wall extending above the surface has been closed over with stone and cement. Many accidents occurred during the building of the project, and many times terrible typhoons came to tear down the work and to dash out human life against the masonry. The breakwater, taking an irregular course, yet nevertheless describing a sort of semi-circle, extends out into the bay for nearly two miles. At lengthy intervals there are wide openings to permit the passage of vessels. In this inclosure ships, large and small, are safe from harm.



A PORTION OF THE BREAKWATER, SHIPYARD AND A GENERAL VIEW OF THE NEW PORT OF MANILA.

But the harbor improvements that have given us distinction for progress above all competitors,—white, brown, or yellow,—in the Far East, are the wharf-building projects undertaken. The United States government built the first wharf for sea-going vessels to tie to in the Far East. Hongkong, lying just

across from Manila's front door, and fifth largest seaport in the world, where the British have been in control for a long time, never has had a wharf for seagoing ships. Nor has Shanghai or Singapore, other world ports. The day the first wharf was completed by Uncle Sam saw the beginning of the end of the annoying lightering of cargoes from shipside to shore.

The federal government constructed its military piers of the best materials. The piles are concrete; the timbers the best native hardwoods; the warehouses steel and galvanized iron. The insular government is also busy building fine, large steel piers, and the commercial world has followed the government example. Some of the leading American firms are acquiring tracts of the reclaimed ground just back of the government wharves and warehouses, for building commercial "godowns" and storehouses of steel and concrete. One big firm has built a large, commodious office building alongside its godowns on the fill.

New Manila Hotel. Built on Reclaimed Land.

The reclaimed area lies southward from the mouth of the Pasig on the opposite side of the stream from new Manila, where the business of the city is carried on. At present the only bridges giving access to the commercial center from the wharves are located nearly a mile up the river. Because of this, the government will soon undertake the construction of the largest bridge yet built across the Pasig. It will be located near the mouth, and will be of the draw type. It will have double tracks for steam trains, a double roadway, a double track for trolley cars, and walks on either side for pedestrians. Over it the steam and electric railroads will build spurs to the dockyards. A magnificent new custom house will be built by the insular government in the vicinity of the wharves, the old custom house being located far up the river away from the foreign shipping.

Although man has wrought wonders in making Manila a world port in so far as shipping conveniences are concerned, the Pasig river needs little improvement. It will be a long time before its usefulness as an avenue for commerce is superseded by a fabricated competitor. Behind the Rio Pasig lies a story of one of the grandest systems of municipal waterways in the world. Unlike the river itself, the system needs some little attention. And it is soon to get it,—just as soon as our officials find the time. Manila is a perfect network of canals,—*esteros* they call them out there,—most of which are natural. Over these canals, under the old system of lightering cargoes from ships, the city's goods have been brought to the storehouses. The leading firms since time immemorial have had their "godowns" or warehouses located along these canals, all navigable for lorchas and cascoes. The district through which the Binondo canal—the largest—runs is a veritable storehouse center. The canals have always saved cartage fees from lighter to storehouse door, and they are to continue. Of course, as the city grows,

THE *MINNESOTA*, ONE OF THE BIG TRANSPACIFIC STEAMERS THAT CALL REGULARLY AT MANILA.

new factories and storehouses are going up in the outlying districts. These must be fed by railroads and drays. But the canals, which are a source of some annoyance to the health department on account of their unsanitary condition, are soon to be thoroughly cleaned, and the banks walled up with a solid coating of cement. Furthermore, they will be made self-flushing with the tides, which will keep them clean at all times.

The new harbor inclosed by the breakwater has also what is termed an inner basin, a waterway much smaller than the harbor proper. This basin is for small craft, and a narrow canal, acting as a short-cut for launches, runs from it into the Pasig at a considerable distance up

THE AYALA BRIDGE OVER THE RIO PASIG, MANILA—A SAMPLE OF THE TYPE OF BRIDGE BEING ERECTED IN THE PHILIPPINE ISLANDS.

stream. On the city-side of this little canal stands a row of frame storehouses built in the early days for storing army supplies. On the sea-side of the canal is Engineer Island, reclaimed from the bay. Engineer Island is the home of the Bureau of Navigation, pertaining to the insular government. In the rear of the office buildings are the shops and shipyards, with a narrow waterway for harboring the civil government's coast guard ships and custom house vessels. A marine slip is in operation for repair work and for building small craft.

Hongkong, Shanghai and Singapore should look well to their shipping facilities. If they do not it will not be long before one, or all of them, will be making a place in shipping tables for Manila as a world port. As far as harbors go, and certainly where *docking* facilities are concerned, Manila has the trio badly bested. At present the other ports have the shipping. That's what counts in marine statistics, and in business. But they won't have it long. The hotel that has the best beds catches the majority of the weary. So it is with shipping. Boats will berth where harbors are best. It is much the same way in berthing boats.

The Rose

Come, my Mignonne, let us go—
  Let us see if yonder rose,
  That this morning did disclose
  Robes of crimson to the sun,
  Now that evening has begun,
Still with tints like yours does glow.

Ah, my Mignonne, look and see—
  Look there, underneath the bough;
  Short the space from then till now,
  But its beauties all are past!
  Scarce from morn till eve they last—
Such is nature's harsh decree.

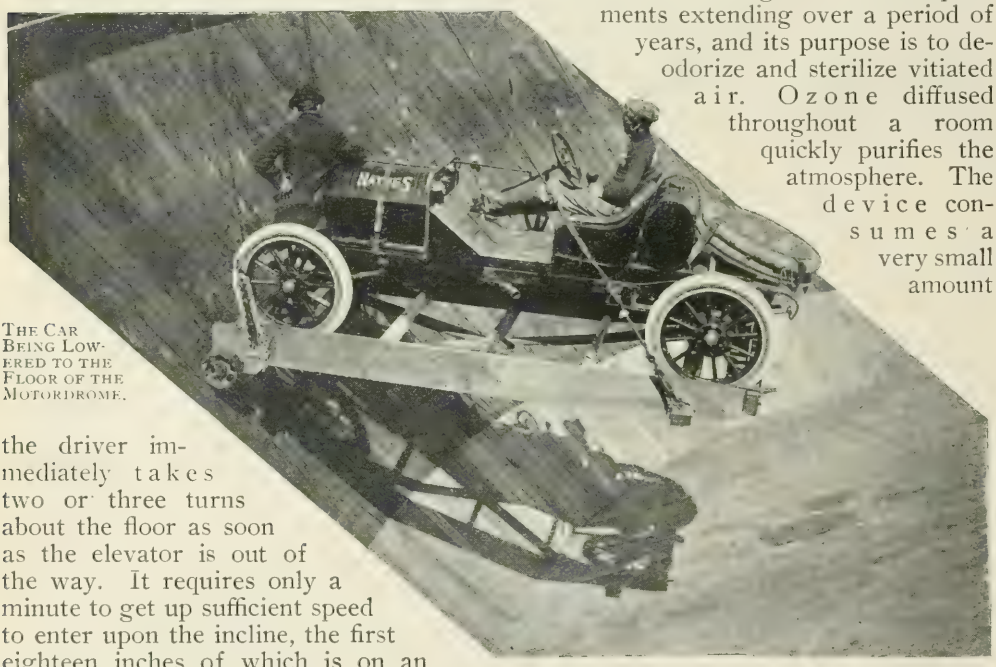
Ah, my Mignonne, trust to me;
  While your youth as yet is seen
  In its freshest, fairest green,
  Seize the moments to enjoy;
  Old age hastens to destroy
Roses, beauty, youth, and thee.

—Pierre Ronsard.

MOTORING ON A 75 PER CENT INCLINE

NO more daring feat in motoring is known than the dizzy whirl of an automobile about a circular track with an incline of 75 degrees. This exhibition is performed in a motordrome which is only seventy feet in diameter and about fifteen feet in depth, a veritable pit, with walls so nearly perpendicular that it seems absolutely impossible for a car to maintain itself upon them.

The stock roadster is lowered into the motordrome by means of an elevator and the driver immediately takes two or three turns about the floor as soon as the elevator is out of the way. It requires only a minute to get up sufficient speed to enter upon the incline, the first eighteen inches of which is on an easier grade. Then the driver starts working his way up the walls, continually increasing his speed as he whirls round and round, until, as he approaches within about a foot of the railing at the top, he is running at the speed of fifty-five miles an hour. The descent is made much more rapidly, only a couple of times around bringing him once more to the floor of the pit, where the car is again run upon the elevator and hoisted to the top.



THE CAR BEING LOWERED TO THE FLOOR OF THE MOTORDROME.

The motordrome is built with a track of heavy planking, braced very carefully to withstand the enormous strain that is put upon it several times a day.

This feat seems like suicide for the driver, and in fact one very severe accident occurred here, but the daring young chap at the wheel takes his work very coolly. The track, which is probably the world's steepest motor course, is located at Venice, California.

MACHINE TO PURIFY AIR

AN apparatus for generating ozone in moderate quantities by means of a high pressure electrical discharge through the air has recently been put on the market. It represents the concrete result of investigations and experiments extending over a period of years, and its purpose is to deodorize and sterilize vitiated air. Ozone diffused throughout a room quickly purifies the atmosphere. The device consumes a very small amount of current and the cost of operation is trifling. The value of such a machine for promoting health is readily apparent.

Although ozone, its properties and useful application have been known and studied by scientific authorities for many years, probably a large percentage of the public is not acquainted with its valuable characteristics and practical use. In 1785 von Marum observed that oxygen or air through which an electric discharge had taken place was possessed of a peculiar odor. He referred to this as the "smell of electricity." The same "smell" is distinctly noticeable if one happens to be in the vicinity of a bolt of

lightning during a thunder storm. It is caused by some of the oxygen in the air being changed into ozone, which produces the particularly fresh and wholesome smell of the atmosphere after an electrical storm.

Ozone is a colorless gas, over a wide range of pressure and temperature, with an odor in mild concentrations resembling somewhat that of chlorine and in strong concentrations resembling that of phosphorus.

The action of ozone in the atmosphere, through chemical affinity, oxidizes or burns up floating bacteria and micro-

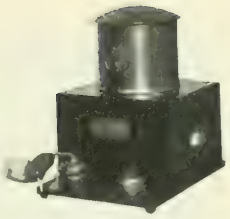
On an Incline of 75 Degrees.

scopic impurities, in which the percentage of carbon is high. It has a germicidal effect in respirable quantities with no deleterious action on higher forms of animal life. It is nature's own method of purifying air.

Four types of the new apparatus are manufactured. Each contains a step-up transformer, an ozonizer and, in some cases, a blower. The transformer is located in the lower part of the case and changes the supply voltage in the alternating current machine to a value sufficiently high to produce ozone in sufficient quantities when applied to the ozone generating units.

Another Form of the Air-Purifier.

CAMERA WITHOUT LENS



A Form of the Air-Purifier for Home Use.

THE simplest possible photographic camera, in which the lens is replaced by a thin, generally circular, aperture, has so far been little used for practical purposes, the images never being very sharp, while exposures, on account of the deficient luminosity of the aperture, were much longer than in the case of real objectives. Only quite recently have landscape photographers realized the advantages to be derived from this simple and cheap apparatus, viz., the extraordinary softness and depth in shading and the absence of any reflection and deformation usually incident to the process.

It has occurred to Mr. Wolfgang Otto, of Kiel, Germany, that the idea of this hole camera, as it is called, could be further developed by substituting two slots for the single aperture used in the original apparatus.

The "slot camera," as the new attachment is called, comprises in the head wall, in the place of a thin aperture, a straight slot and, at a certain distance behind, another air-tight partition likewise with a similar slot. However, the two slots are set differently, one being vertical and

PHOTO TAKEN WITHOUT LENS.
The effect of the horizontal slot.

the other horizontal, though other positions may be chosen. Moreover, the partitions may be slanting or curved, and, finally, the same wall may comprise several slots instead of a single one.

The simplest and most general case, however, is that of two slots arranged vertically and horizontally, respectively. All vertical lines of the object are then reproduced on such a scale as though the projecting aperture were situated in the horizontal slot, and, inversely, the dimensions of any horizontal lines in the picture are determined by the distance between the vertical slot and the photographic plate. If, for instance, the vertical slot be shorter than the horizontal, the vertical lines of the picture will appear lengthened—or the horizontal shortened—in proportion, and *vice versa*. Striking effects are produced by comparing two views of the same object taken from the same point, with the shorter and longer slots, respectively, alternately horizontal and vertical. In all other respects the image behaves like that produced by a hole camera.

THE EFFECT OF THE VERTICAL SLOT

The slot camera, so far from being a scientific toy, is intended to serve many useful purposes. One of its possible applications is, in fact, for architects, in the rapid variation of plans, for caricaturists, in producing comical effects by deformation, for the decorative painter, in varying any given patterns for fabrics and carpets, and altering the different forms of type.

TO MARK FRUIT WITH LETTERS

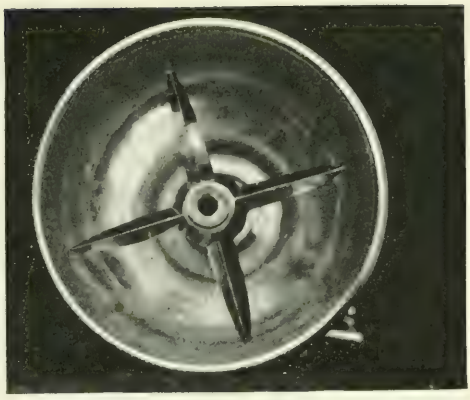
TO send fruit to the table bearing the initials of the various diners, the apple, pear, or other sort of fruit must have the letters traced upon it—when it is green or unripe—with some substance such as lampblack, that is opaque and impervious to the sun's rays. If this is done carefully and the fruit allowed to ripen, when ready for eating the lampblack can be removed leaving the initial standing out green against a red or rich brown background of the ripened fruit. If something more ambitious than the initial is wanted, there is no limit to the amount of lettering or design that may be traced on the fruit, except the amount of surface at the disposal of the "artist" who has been chosen to do this unusual work.

This "style" of serving apples or other fruits makes a decided hit at parties or other social affairs where it is desired to produce unusual effects. In particular, children are more than delighted with the novelty of having served to them the fine luscious fruit, engraved, by nature's art, with their own initials.

INITIALS GROWN ON AN APPLE.

BUBBLING FOUNTAIN THAT CUTS CHIN

A SANITARY fountain that is in reality "sanitary" was recently installed in the District Building, the home of the government of the District of Columbia. It is being experimented with by the governments of other municipalities. The fountain in question represents an improvement on the now popular "bubbling" kind, which did away with the aid of cups and glasses. The model which the District government has adopted is similar to the other "bubbling" kinds in several respects, but differs in an important point. Four sharp knife blades are crossed horizontally over the fountain top. No mouth is big enough to go over them. Any attempt to bite the fountain nozzle results in a sharply cut or indented chin. The person drinking cannot get the mouth upon the fountain, but must drink from the bubbling-up stream. The disposition of small boys to bite the nozzle of the original bubbling fountain is curbed and broken by the new improvement. The superintendent of the District Building is the inventor of the fountain.



New Sanitary Fountain as It Appears from Above.

The Edged Blades of the Bubbling Fountain.

NOT CINDERS BUT GRAPES

THE Southern Pacific railroad during the past harvest season was compelled to rig up flat cars for handling grapes intended for the larger wineries that manufacture most of the sweet wine made in California. This was because of the extraordinary demand for all freight cars. Many a time box cars have been used for this purpose, but this year has been the first flat cars were called into requisition. On arrival at the winery, these grapes were forked on an elevator belt, which was brought directly to the side of the car. The grapes were conveyed directly to the crushers, and thence the crushed mass went to the fermenting vats by mechanical conveyance. The only time the grapes were touched by hand was when they were picked.

The necessity for handling grapes by this method very significantly indicates what a great shortage of cars prevails in this country during the harvest season.

Shipping Grapes on Flat Cars.
Scarcity of other cars in the harvest season made this necessary.

JACK RABBITS of

A MOMENT TENSE WITH EXCITEMENT

PUT a battery of rapid-fire Gatling guns into a long, flat tub; fasten a short step-ladder, with wide steps, lengthwise, to the bottom of the tub; set the guns to roaring in chorus and turn the whole thing loose on the surface of the terrified ocean, over which it tears in a welter of spray, racket, gasoline and confusion—like a gigantic water-bug, gone crazy with the heat and trying to run away from the devil, with his satanic majesty just two feet behind and gaining with every jump!

Thus one gains a faint, far-off idea of a modern hydroplane or racing motor-boat in action.

The faster a hydroplane goes the more it climbs the step-ladder and stands up above the surface of the water, until it jumps from wave to wave in a way which has given it the nick-name of the jack-rabbit of the wave. This name becomes somewhat inappropriate, however, when —as not infrequently happens—the ton and a half of gasoline engine gets too far towards the front of the boat and the whole apparatus takes a sudden dive—head-foremost—into the depths of the ocean; in which case the owner and the driver of the craft usually find other nick-names coming more quickly to their tongues!

The idea of the hydroplane as a racing-machine is that it shall go on the surface of the water, instead of through it; the faster it goes, the more of the boat sticks out above the sea, so that it has only the resistance of the air to overcome. So fast can these craft be driven that the *Maple Leaf IV,* the British-built, Canadian-owned hydroplane, which won the international trophy at Huntington Bay, Long Island, last summer, covered the thirty-mile course in a fraction less than 48 minutes, which is about a mile in a minute and a half.

The *Maple Leaf* was built at Cowes, England. It is forty feet long, by nine feet in width, with five "steps" beneath its keel and five projecting planes on either side. The thin keel is of veneered mahogany. The power plant consists of two 380-horsepower engines, with twelve cylinders each.

Disturber III, another racing hydroplane, owned by J. A. Pugh, of Chicago, is a second forty footer, with a total displacement of 8,500 pounds. Her two twelve-cylinder motors develop 275 horsepower each, when running 1,700 revolutions to the minute. Each motor weighs 1,600 pounds.

The cost of one of these freak racing machines is enormous. Their utility consists only in enabling the owner to rush frantically over the surface of the water at a terrific rate of speed.

the WAVES

By Edward I. Pratt

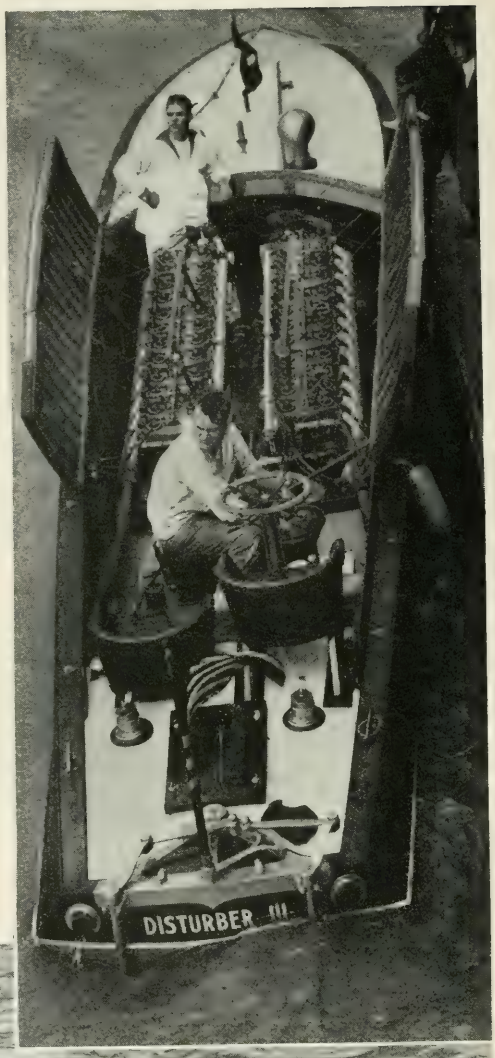
—THE START OF THE RACE.

THE CREW OF THE *DISTURBER III* WEAR LIFE BELTS.

DEBUTANTE. AN ENGLISH ENTRANT IN THE MOTOR BOAT RACES AT CHICAGO, AT THE FINISH.

Most of the builders and a few of the owners of these odd craft talk enthusiastically of a great future for the hydroplane. They say it is not a passing freak, but that in the coming seasons this water rabbit will possess greater size and power. Still, to what use, other than that of racing, can it be put? many have asked. But, on the other hand, it is pointed out, the remarkable performances of the hydroplane thus far illustrate the present extraordinary development of the gasoline engine, and give a hint of the possibilities of its future development.

The hydroplane seems to the uninitiated to have burst into life with all of the abruptness, if not altogether with the romanticism, of Venus rising from the waves. As a matter of fact it had a prosaic origin years ago. Among others, an English clergyman saw the advantages of a boat propelled by planes. No suitable engine with power enough, however, could be obtained, so the idea, as it was many times subsequently, had to be abandoned. Then, finally, with the demonstrated efficiency of the gasoline engine in automobile, flying-machine and motor boat, the idea of the hydroplane burst forth anew.



THE CRACK RACER,
Disturber III.

UNSORTED FISH JUST DUMPED IN THE BIN FROM THE TRAWL.

NAVAL BATTLE WITH FRANCE

By

BERTRAND SHERBURNE

"THERE were twenty odd sail of French otter trawlers on Bank Quere. One of these otter trawlers dragged through all our trawls and cut and carried away on his otter boards about two-thirds of our nets, so that we had to put in to Sidney to refit. The following day I went aboard the Frenchy and complained about the destruction of our nets. He said he could not avoid our trawls and had a perfect right to fish his way of fishing on the high seas, even though it did destroy other people's property. On the next day he dragged through the balance of our gear, within about seventy yards of our vessel, making a complete circle and I fired three rifle shots at him. One ball lodged in the woodwork on his bridge and then he went away and left us. But we had to put back in to Sidney and refit again, costing us $580 for new nets."

The cool old Yankee skipper, who made that report of a bloodless naval battle with France before the Fisheries Committee of Congress, is one of many thousands of deep-sea fishermen, sailing out of New England ports, who are up in arms against the ravages of French and English fishing steamers, which, having exhausted and ruined the fishing in

the North Sea and other European waters, are now beginning their work of devastation along the Grand Banks, the Georges Bank, and the other fishing beds, on which the United States and Canada must depend for their supply of cod, halibut, and the other deep-sea fishes that grace their tables.

Beam- or otter-trawling consists in dragging through the ocean, at a great depth, an enormous net-pocket, more than a hundred feet in width, kept open by metal-edged boards, called otter-boards, and fitted with wide-spreading wings which irresistibly sweep into the pocket whatever comes in contact with them. Where the ordinary nets catch only fish of marketable size, the otter-trawl brings up everything, from tiny spawn to huge cod and flounders. The smaller fish are pitchforked back into the ocean, but it is a matter of record that ninety per cent of them are killed in the process. In this way the best fishing banks are quickly ruined, as have been those in the North Sea, which, under more humane and saner conditions, furnished plentiful supplies of fish for hundreds of years. It is the exhaustion of these fishing grounds which has thrown many English companies into bankruptcy and has driven others—both English and French—to send their ships across the Atlantic.

Meanwhile the relentless work of the otter-trawlers, in destroying the nets set by Yankee skippers, has driven many of the New England fishing fleet out of the business and induced others to fit their fishing vessels with gasoline power and send them around the Horn to the Pacific fisheries, where otter-trawling has not yet been introduced.

To stop the destruction of the fishing beds off the Grand Banks and, at the same time to protect their own fishermen from having their gear destroyed, the Canadian government is already moving. It has forbidden otter-trawlers to fish inside the three-mile international boundary and efforts are being made to forbid the landing of fish at her ports which are caught by otter-trawlers in international waters and to forbid the selling of coal to such vessels. The latter provision the Canadians think would stop the encroachment of foreign vessels, as none of them could carry a sufficient supply of coal for a round-trip.

"The introduction of the otter trawl means a cheap food supply for the people," declare the steam trawl men.

"Until you have driven us from the field, formed a trust, and monopolized the fishing industry," reply the New England fishermen. "Then you will do as the other trusts have done, until your source of supply is exhausted within a few years, when you will be in as bad shape as ourselves, and the American people will be without an ocean fish supply."

Already many of these men have sold their vessels or sailed them around "The Horn" to engage in the Pacific coast fisheries, rather than remain and fight "the juggernaut." For many months, the marine news of the New England papers has contained items such as the following:

"Yesterday the schooner *Madonna* was towed up to this port [Boston] from Gloucester to load for Nova Scotia. It was not the first time that the schooner had been in Boston, for many times she has docked at T wharf to land big cargoes of fish."

"The schooner *George S. Parker,* which, up to three weeks ago, sailed from Boston and Gloucester to the Georges Bank with a crew of twenty men, is now at Cape Breton, having been sold to Newfoundland parties."

"The schooner *Dauntless,* formerly one of the prides of the Essex fleet, also has been sold, and will hereafter be classed under the British registry. The crack schooner *Oregon,* of Gloucester, also has been turned over to Newfoundland parties."

Or one runs across such statements as the following, which was made by Captain N. C. Forbes of the schooner *Athens* and Captain Herbert W. Nickerson of the schooner *Victor and Ethan* recently:

"On account of the beam or otter trawlers operating on this [New England] coast and seeing the damage to the fishing grounds and the destruction to the small fish, we fitted our vessels with gasoline engines and sent them around the Horn to the Pacific coast."

The typical otter trawler costs about $50,000, and is of steel construction, with

a length of 125 feet, a beam of 22 feet, a draft of 13 feet, and a gross tonnage of about 240. The hold has a capacity of about 120,000 pounds of iced fish. The winch for the trawls is provided with two drums, carrying ⅞-inch cable, to which the trawls are attached.

The average ship's company consists of 19 men in all. The crew works in six-hour shifts, each man working six hours and resting the next six hours. The work is carried on night and day, arc lights being provided for the night work.

A trip usually takes four or five days, two of which are consumed in the passage to and from the fishing ground, in the case of those vessels under consideration, which dock in Boston and fish on Georges Bank. This leaves two to three days for the fishing.

When the bank is reached, the trawls are put out and dragged for about an hour and a half, at the rate of four miles an hour. Thus each trawl will cover a six-mile strip about 100 feet wide, or a total area of about 73 acres. After the haul, the bag is swung aboard, the "cod end" knot untied, and the fish pour on the deck. The crew then set to work sorting the fish with pitchforks. The non-marketable fish, such as skates, dog-fish, sculpins, and monk-fish, together with all those edible fish which are too small to be marketable are shoveled overboard. Of the discarded fish which are shoveled overboard, it is conceded by even a biased authority, that 100 per cent of the small cod and haddock thus rejected are dead, or mortally wounded. A large portion of these are strangled by dragging in the bag of the net, while those which survive this treatment meet with injury from the pitchforks.

Throwing the Rejected Fish Overboard with Pitchforks.

Landing the Catch on an Otter Trawler.

Prosperity means insolvency for the otter trawler. On March 18th of this year, the following statement was made by James William Baron Chapman, of Grimsby,

which is one of the chief trawler ports of England. Chapman has been editor of the Grimsby Daily Mail for the past nineteen years, and is well known in press circles in Great Britain and on the continent. He says:

"From my own knowledge of the trawling industry I am able to say that no money would be subscribed locally for the formation of a new trawling company. There are upwards of 700 steam trawlers fishing out of Grimsby, and these, in the majority of cases, are owned by companies who either pay no dividend at all, or, in the best of cases, only a small one. The pioneer company is the Grimsby and North Sea Steam Trawling Company, with a fleet of over 50 vessels. Up to fifteen years ago they paid a dividend of from 15 to 25 per cent, together with a bonus. Since then the shares have gradually depreciated in value, until, at the present time, a ten-pound share, of which eight pounds has been paid up, is worth only ten shillings. For the past five years this company, which is practically managed, has not paid any dividend. Messrs. J. and G. Alward, Ltd., another local company, is now in liquidation. The Consolidated Steam Fishing Company, Ltd., the latest of the local companies, has been in the hands of a receiver for the past three or four years.

"In a few years, the incessant fishing depletes the breeding grounds, for, wherever steam trawlers fish, there is no interval to allow breeding; and the method of steam trawling is such that the bottom of the sea is ruthlessly swept, and thus enormous destruction is done to the breeding centers."

Foreign countries have legislated, and fishermen have sought for relief, but the remedies have been sought too late. The cry of "vested interests" has made members of Parliament in England stay the hand which was to approve the measure. Millions of pounds are invested in trawling companies abroad and adverse legislation is headed off.

We have in this country a great body of small fishermen who compete freely and cheerfully for their portion of the profits of the business. In fact the system of profit-sharing in vogue on the New England fishing schooners is almost too ideal to be believed, in this age of civilization. A certain deduction is made from the profits of the trip as the vessel's share, or the return on invested capital. Another allotment is made to the skipper, whose management of the vessel involves superior knowledge and a correspondingly greater compensation. The remainder is equally divided among the crew. From Eastport, Maine, to Nantucket, the fishermen put out in their schooners and battle with the icy blasts and the ocean billows. Each town has its particular type of boat. There is the Swampscott and Marblehead sailing dory; the Cape Cod cat boat, with its enormous rudder; the Portland power boat; the small sloop of Penobscott Bay and contiguous waters; and the big power dory, sailing from T wharf, Boston. One by one they have fallen off, since the days of the New Bedford whalers, and now the fishermen see the end of the fishing in the introduction of the steam trawler. What can they turn to next?

Some recommend the propagation of fish by the fish hatcheries to replace the number destroyed. Eight hundred thousand dollars yearly is the bill of the United States fish commission for the propagation of fish and their distribution in the waters of the United States, and yet, say the fishermen, one steam trawler can do more damage than can be repaired by a dozen fish hatcheries working night and day.

One of the final acts of the Congressional session preceding the present one, was the appropriation of $5,000 with which the Fish Commissioner was directed to make a thorough practical investigation of the subject of otter trawling and report his findings, with a recommendation, to Congress.

THE CAMP OUTFIT OF THE CRUSADER AGAINST THE WHITE PLAGUE.

MOTORCYCLE TO FIGHT WHITE PLAGUE

RIDING from village to village through the State of Wisconsin, an enthusiastic scout in the anti-tuberculosis campaign is now making the tour of the rural districts on his motorcycle. His name is Theodore Werle and he is one of the most efficient workers in the Wisconsin Anti-Tuberculosis Association. As his plan is to gather an audience among the farmers, he is likely to be found early in the morning talking to the crowd about a creamery where milk is being delivered. Noon may find him at some cross-roads store, and evening in some village far away addressing a gathering at the schoolhouse.

In delivering his daylight lectures, Mr. Werle makes use of a sixty-foot panorama, three feet high, a roll of canvas painted with striking pictures and diagrams that illustrate his points. For night work, he makes use of a stereopticon, and if the weather is fine he delivers his illustrated lecture out of doors. Literature for free distribution is carried as well.

In order to be absolutely independent of hotels, Mr. Werle carries a complete camp outfit, including shelter tent, stove, cooking utensils and bedding, together with wet weather clothes in case of rainy-day travel. This equipment attracts considerable attention, and there is no need to advertise his lectures in most communities.

A MOTORCYCLE CARRIES EVERYTHING.

BERLIN ACROBAT JUMPING OVER A HOUSE.
This remarkable feat of Gerhardi Moler was performed after he had leaped over two carriages and sixteen soldiers holding guns with bayonets fixed.

HOW DID THE PHOTOGRAPHER GET THIS REMARKABLE RESULT?

A TIP TOP VIEW

IT has been said that some of the giant trees of the Far West are so high that one is able to see only part of the distance to the top, it being necessary to begin again where the sight left off. Be that as it may, these trees represented in the picture are two hundred feet in height. The puzzling effect shown in the illustration was obtained by the photographer pointing his camera straight up towards the tops of these giants. They grow near Klamath, Oregon.

PASSING OF HUSKING BEES

THE days of the husking bee are passing in the corn belt and mechanical aids to gathering the immense corn crop are coming to be used more and more. One of the most successful of the mechanical corn pickers and huskers is shown in the accompanying illustration, the machine being operated with a four-horsepower gasoline engine. Similar machines, without the aid of the engine, require five or six horses. With the engine attached, three horses are able to handle the machine in corn, yielding as high as sixty bushels to the acre. The corn is picked, husked and deposited in the wagon in an incredibly short time, thus making still more easy the lot of the farmer, to whose aid mechanical genius has come in almost every conceivable manner.

MECHANICAL CORN HUSKER WITH GASOLINE ENGINE ATTACHED.

SEA OF CLOUDS

ONE who has never been above the clouds would naturally suppose that the picture on the next page is that of a body of water, with a rock's top projecting above the waves in the foreground. As a matter of fact it represents a photograph taken above the clouds on the summit of Mount Tamalpais, California. At the lower right-hand corner may be

seen outlines of trees on the side of the mountain, while the object which looks like a rock in the foreground is the summit of another peak.

It is seldom that so perfect a scene, one in which the illusion is so complete in every way, presents itself to the photographer for pictorial record.

SUNLESS SUNBURN

THE sunburn which the lounger on the beach endeavors to avoid while getting a deep tan, is really valuable, due to the effect of the actinic, or chemical, rays of the sun upon the skin, for when these rays strike the surface of the body they open the blood-vessels of the skin. In bad cases of sunburn the blood vessels, for instance, are capable of containing from one-half to two-thirds of all the blood in the body. This means that any organ that may be congested, the stomach or liver say, is relieved of the surplus blood that has oppressed it. The increased movement of the blood, too, means a more efficient elimination from the body of wastes, while the absorption into the system of food materials is also accelerated.

THE MERCURY VAPOR LAMP—A SUBSTITUTE FOR THE SUN.

The treatment of skin diseases is especially assisted by this improved circulation in the skin tissues, eczema, acne, psoriasis, etc., yielding very readily to the influence of the actinic rays of the sun.

Now solar systems are not a commodity that can be conveniently manufactured in a laboratory—on a large scale, at least; but a fairly good substitute for the sun, so far as the actinic rays are concerned, has been invented in what is known as the "quartz mercury vapor lamp." This device does not differ in essentials from the mercury vapor

NOT WAVES OF THE OCEAN—BUT WAVES OF THE SKY.

lamp of commerce. The chief difference is in the composition of the tube, which, as ordinarily used in the commercial vapor lamp, is of common glass, and this does not permit the escape of the actinic rays.

In the therapeutic lamp, however, the tube is made of very select quartz glass, especially made with a view to permitting the passage of the chemical rays. At the top of the lamp, as shown in the accompanying illustration, two pairs of fan-shaped air coolers can be seen, attached for the purpose of carrying off the intense heat generated by the lamp when in operation.

With the mercury vapor lamp a sunburn can be secured in from three to five minutes—and this in the very dead of winter, which is not a remarkably popular season for sunburn. Even on cloudy days, or at midnight this sunless sunburn is on tap.

The supreme ambition of the young man who takes a summer vacation at the seaside is to get a coat of tan. What a splendid opportunity the new apparatus offers him, and without the inconvenience of blistering or "peeling" incident, too often, to the sun process.

BANISHING THE "TICKLER"

THE "tickler," that little stick tipped with feathers, which is known wherever a carnival company ever has visited, and which has done so much to enliven the countless thousands of persons visiting Washington during Inauguration week, is to be banned. The board of commissioners—the city fathers of the national capitol—acting on the advice of medical specialists, have determined that as a transmitter of diseases, the tickler is in a class by itself. It is used to tickle the mouths and noses of men and women as they pass through the crowded streets, and the transfer of disease germs is an easy matter. As a menace to health it has no equal, the commissioners believe, and a substitute mirth producer will have to be adopted by the inauguration visitors next April, the month in which Mr. Wilson has requested the festivities be held.

THE SEA-GOING DREDGE, *URUGUAY VII.*

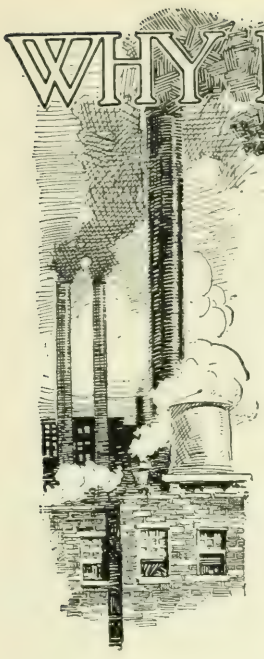
SEAGOING DREDGE UNDER ITS OWN POWER

THE Dutch dredge *Uruguay VII,* operated by the Uruguayan government was built at Leiden, Holland. With it the material dredged can be raised either by a bucket-chain or suction pump and delivered in barges alongside, or through a floating pipeline, direct on shore, at a distance of one thousand feet against a height of twenty feet. The length over all is 145 feet. It has a maximum draught of five feet; its dredging depth is twenty-seven feet. The vessel is provided with two engines. One engine is placed lengthwise for driving the suction pump and the propeller, the second engine is placed athwartships for working the bucket-chain.

She made the voyage to Montevideo under her own steam.

WHY FACTORIES FAIL

By Forrest Crissey



MANY a man with only a moderate amount of technical training or practical shop experience behind him is suddenly tempted to start a manufacturing business of his own or to buy an interest in one that is already started. He thinks he sees Opportunity beckoning him to independence. This temptation is especially appealing to an energetic and ambitious young man who has acquired a fair amount of technical theory along with some actual shop practice. In other words the shop man who is most worth while is most liable to this allurement. Because a young man of this kind is alert, travels with his eyes open and has a well-nourished determination to become his own boss and get into the game for himself at the earliest possible opportunity, he is especially liable to the temptation of making an unwise venture and getting in over his depth.

Those who make this mistake generally do so because *they do not know how to look for the weak spots in a business* before they tie themselves up to it. But there are well established principles of preliminary investigation that, if understood and applied, would help to avoid many a disaster of this kind. And the rules for locating, in advance, the weak spots in a manufacturing business are much more simple than might be supposed.

One of the most practical efficiency engineers in America declares that the first thing to do, when confronted with a temptation to go into a manufacturing business, either as an owner or as a responsible executive, is to get at, in a very definite and precise way, two kinds of troubles: First, those that are common to the business as a whole; Second, those that are individual to the particular plant in question. He illustrates this by pointing to the machine tool business and especially to the smaller plants in that line.

"With the exception of comparatively few large plants in this industry the men at the head of the individual concerns have come up from the workman's bench or lathe; they are fine machinists but poor financiers. Because they have that training behind them, the emphasis of their energy and attention is placed on the producing end of their business rather than upon the selling or upon their organization or their finances. In a word, because they have spent a considerable part of their lives as workmen, they never lose the pay-envelope viewpoint; they continue to look upon their income as a wage or a salary instead of seeing it for what it really is: *the profit upon an investment.*

"What is the result? In general it is that the machine tool business and especially the smaller concerns in that industry are not handled with the keen business acumen characteristic of many other lines of manufacturing. For one thing, there is an almost universal tendency to put the profits back into the shop, and to rest content if the business 'breaks even' after paying the workmen their wages and the executives their salaries. Having made searching investigations of many machine-tool plants—both large ones and those of only moderate size—I can speak on this point from experience and with conviction. It is hardly too much to say that I have not found more than two machine-tool plants, in all those that I have investigated, that were not suffering from this cause. It is not uncommon to find a shop having an actual investment of one hundred and

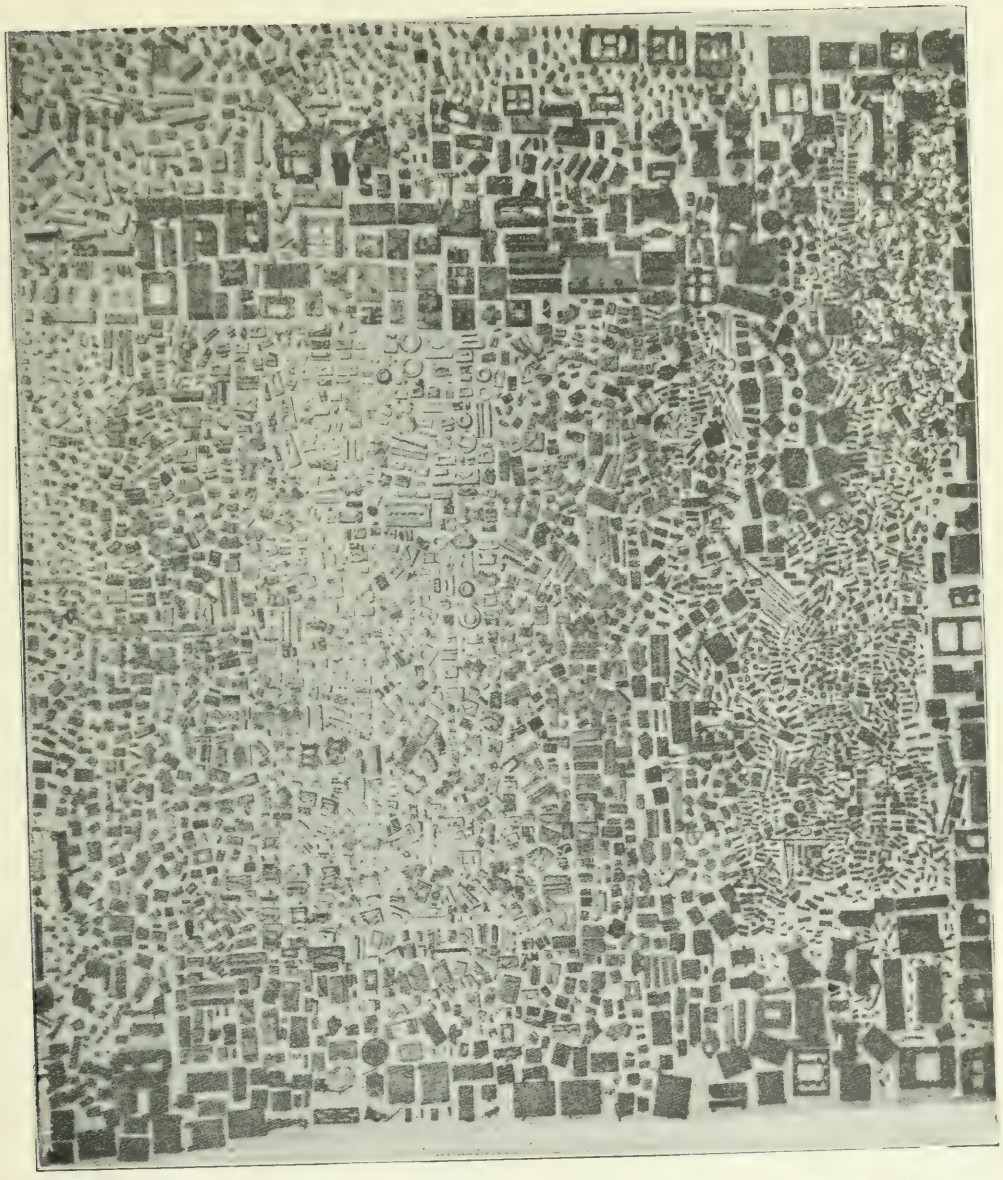
fifty thousand dollars that turns out only two hundred thousand dollars worth of product a year; often I have found machine-tool plants where the gross yearly sales were less than the capital invested. It doesn't require much of a financier to see that such an enterprise is not operated on business principles and I will add that wherever this condition is found, a little digging will disclose the fact that the men at the helm are machinists instead of business men and that their minds are on the technical instead of the financial end of their enterprise. When I am called into consultation on a situation of this sort I invariably find out at the start how much the plant has invested in *special* jigs and fixtures. Sometimes I have found half the capital of a concern tied up in this special kind of equipment—the most perishable sort of an investment that a shop can make. The moment that a change is made in the product requiring those special jigs and fixtures they become so much junk. And they are liable to be chucked into the discard for quite another reason: the shop owner may suddenly discover that economy of manufacture dictates the substitution of an automatic or semi-automatic machine.

"The whole gist of this situation is that the shop owner is doing business upon too small a margin of profit. He is still standing in his old workman's shoes and still thinking about making things instead of considering the fundamental financial problems of his business like depreciation, overhead expense, interest upon capital invested, frequency of turn-over, and all the other things that come first to the thought of the capitalist whose training has been at the money-till instead of at the workman's bench. And this weakness, remember, runs right through the whole machine-tool industry. You may be sure that each machine-tool industry has its own peculiar weaknesses, but the industry as a whole is afflicted with the one that I have just pointed out and I use this example to drive home the point that any man thinking of embarking in this kind of a venture should first ask himself: 'What are the weaknesses of the trade in general?' After he has answered that question there will be plenty of time for him to take up the special troubles of the particular plant that he may have in mind. And the same principle applies in every branch of manufacturing. First find out the basis upon which the whole business stands; then go after the weaknesses of the individual plant under consideration.

"Literally millions of dollars have been lost to investigators because this simple analysis has not been made before they invested.

"This matter is altogether too important to be left with a single case in point. Let us suppose that you are a young machinist, alive with the determination to get into business for yourself, and that you are able to get together enough capital to make a start in a manufacture of standard light hardware. Perhaps you have been working in a factory of that kind and like the business. As a workman you have seen the product pouring out in a steady stream and have as regularly received your pay envelope. Naturally you draw the inference that this would not go on month after month unless there was good money in the business. Again, suppose that just before you had fully made up your mind to make the venture some man of broad manufacturing experience, in whose opinion you had the greatest confidence, should say to you: 'Young man, before you get into this thing you'd better find out what kind of legs the whole staple hardware business is standing on'—and that in accordance with this suggestion you began to dig into the business as a whole. What would you find?

"First you would find that it is sick; that it is afflicted with a set of atrophied prices as hard, inflexible and unchanging as the laws of the Medes and Persians; that much of this kind of product is turned out at cost and that a very considerable part of it is made at an actual loss. In one factory of this kind I found that twenty per cent of its items were sold at or below cost and had been sold on the same profitless basis for years. Taking one particular item I called the attention of the factory owner to the fact that it cost him about fourteen cents and that he was selling it at ten cents. His answer was: 'But that thing has always been sold for ten cents and you couldn't raise the price on it any more



HALF THE CAPITAL OF A PLANT IS SOMETIMES TIED UP IN JIGS AND FIXTURES.
This photograph shows an array of tools, no two quite alike, that are used in making the parts of one machine.

than you could raise the rock of Gibraltar—the trade simply won't stand for it. The only way by which you may keep me from losing money on that thing is to cut the cost of production four cents or better.'

"Take the item of galvanized tubs and pails: I discovered that the firms that had to buy their steel on the open market were making these articles at a loss ranging from two per cent to ten per cent. This absurd market situation had evidently been brought about by the fact that one manufacturer of this kind of hardware owned his own steel plant and this plant charged the raw material for the tubs and pails to the manufacturing plant at cost. This manufacturer was an aggressive competitor in the hardware trade and preferred to take his profits from his hardware factory instead of from his steel plant. As a consequence

he disorganized the whole hardware trade, at least in the matter of galvanized pails and tubs.

"There are scores of other items in staple hardware on which prices have become fixed and immovable and these articles are sold, year after year, at cost or lower. The only method by which they may be made to pay their way, or anything like it, is as car-lot fillers to bring a shipment up to the car-load minimum. This disease of atrophied or standardized prices is almost universal in the staple light hardware line. Of course the manufacturer always does his best to 'even up' on specialties and certain staple articles that have not yet been forced down to the cost line and passed into the immovable price class. But an industry that makes a business of turning out a large part of its product at a loss, and doing it with malice aforethought, with little or no hope for a change in the future, is hardly the business to attract an ambitious young man who wants to get into manufacturing and is not over-equipped with capital.

"When a good average practical man with his wits about him starts out to take a business apart to see what makes it go, the things that he will turn up will surprise him. At almost every step of the way he will get a new angle on the almost childish methods that are common to large businesses—I speak especially of manufacturing because that is a branch of industry with which I am most familiar—but there is little doubt that the same thing obtains in other lines of merchandising. One of these surprises is the degenerating process through which the output of a thoroughly good factory is subjected in the hands of imitators—or perhaps of its owners. The brass bed will serve as an excellent example of this cheapening process. Often the degradation is accomplished by the same house that brought out the first class original and not by imitators. In this case the greed of a manufacturer gets the better of his sound business judgment; he follows the lure of quick profits instead of sticking to a high-grade policy and product that will win him far greater profits in the long run.

"I have seen one house in this line of manufacturing bring out a new model of bed beautiful in design and thorough in workmanship. Immediately a competitor would come into the field with a practical reproduction of that model at a lower price. This meant that it had been cheapened in construction by the use of lighter brass tubing or in some other manner. At once a third house would go this imitator one better and offer the same model in the second stage of degradation. Before the ripple of imitation had run out the model would be debased to a flimsy thing easily dented, and covered with cheap lacquer, the whole thing publishing its tawdry character on its face. Repeatedly I have seen this process of debasement followed by the firm that brought out the original model. The manufacturer who has the courage and shrewdness to forget what his competitors are doing long enough to learn and meet the real demands of the public and to master the weaknesses of his own output—all this both as to design and quality—is the one that will win out and have a trade that will stay by him and pay him profits.

"I recall two firms in the metal bed business that had this courage and really tried to be original and to better their product in every way. Both of them made a splendid success but one of them made a really remarkable record. Fortunately he had a superintendent blessed with a little originality, a man who had been a workman only ten years before. These two men went right back to the beginning of things and studied their product sanely and intelligently from the viewpoint of the public, of the retail customer. You would be surprised to know how seldom this is done. They designed and constructed a bed for the use and the satisfaction of the retail customer, not a bed merely to be sold to a furniture dealer. Then the owner of the factory passed the word all along down the line that the quality must be kept up and that nothing in the manufacture of this bed should be slighted in any particular. In order to make sure that these instructions were carried out he offered a bonus to his workmen to stimulate good and careful workmanship. He also saw the advertising possibilities of his product and began a moderate advertising

campaign that brought results. By spending $75,000 in this way he created a $200,000 business—or, as he expressed it, 'a $200,000-responsibility to the public.' It was not altogether easy to discharge this responsibility and keep his goods right up to standard. To do this he was obliged to pay the closest attention to small details and educate his workmen all along the line.

"For instance, he was forced to devise a new way of handling the goods in the lacquering process so that the beds would not be touched by the human hands. This was to avoid spotting. But by hard driving at every detail he managed to turn out a superb product that brought him a rich reward.

"On the other hand, the men in the trade that played the game of debasement caught a few quick profits at the start but had no asset in the form of a trade mark, that stayed by them from year to year.

"People are getting entirely away from the problem of cheap or debased goods. Let me tell of a situation in which a manufacturer of umbrellas found himself. And as this man had been a factory workman it again drives home the point that every man that goes from the shop into the head office must keep himself geared up to the closest study of selling and financiering problems instead of following his natural bent and allowing the emphasis of his attention to rest upon matters of production. This man liked to see goods go out of his factory and it did not take him long to learn that a good looking umbrella that could be sold to the trade at a surprisingly low price was in big demand and gave 'volume' to the factory. His salesmen, whose commissions were based upon their gross sales, were not slow to see that they could jump their incomes by pushing the cheap umbrellas to the almost total neglect of the better grades. Finally this man woke up to the fact that his factory was rapidly losing money. He had an idea that the cheaper umbrellas were being sold on 'a narrow margin' but when it was proved to him that every one of those sales meant a net loss to him he was astonished. In fact his loss on these sales was greater than the salesmen's commission on them—and that was a very tidy sum!

"Immediately he eliminated these cheap and losing lines, made better goods and sold them at a price that gave him a living profit and put his salesmen on a commission on profits instead of on gross sales.

FIRMS THAT HAVE TO BUY THEIR STEEL IN THE OPEN MARKET MAKE GALVANIZED PAILS AT A LOSS.
This is true of many other staples.

His sales promptly fell off thirty per cent—and his face fell too, until he figured out the net result. Then he cheered up decidedly, for he found that he was making a good reasonable profit on his entire operations instead of playing a losing game.

"The young or inexperienced manufacturer is very likely to make a serious mistake in failing to realize that his success in the long run depends largely upon his ability to get a firm grip upon a permanent trade—to reach over the shoulder of the middleman and get hold of the hand of the consumer. The only way this can be done is by having a brand of his own and sticking to it through thick and thin. He will have big temptations to do just the opposite of this, for when a jobber comes to him and says 'here is an order for a big lot of your goods but they must bear my brand,' the aggressive young manufacturer is going to think twice before he turns down that order for it is almost certain, in the very nature of things, to be a big one according to his standards. I knew a glove manufacturer that yielded to this temptation at the outset and finally found himself working almost wholly for jobbers at a constantly decreasing margin of profit. But one day he saw the light and determined to establish relations direct with the consumer, no matter how much hard sledding he might have to do so. He fixed his brands and advertised them widely. The first year under this new policy his sales suffered a disheartening shrinkage and his business was conducted at a practical loss; but the second year turned the tide and he made a net profit of twenty per cent on his business. That, however, was the least of his achievements, for he had hooked up with the ultimate consumer and made a permanent demand for his goods that the retailer could not ignore. The jobber was out of the game entirely, from that time on, so far as this manufacturer was concerned.

THERE IS NO BETTER ASSET THAN THAT OF A STANDARD TRADE MARK.

"The manufacturer sells his birthright who sells his goods or allows a sales agent to sell them under a jobber's trade mark.

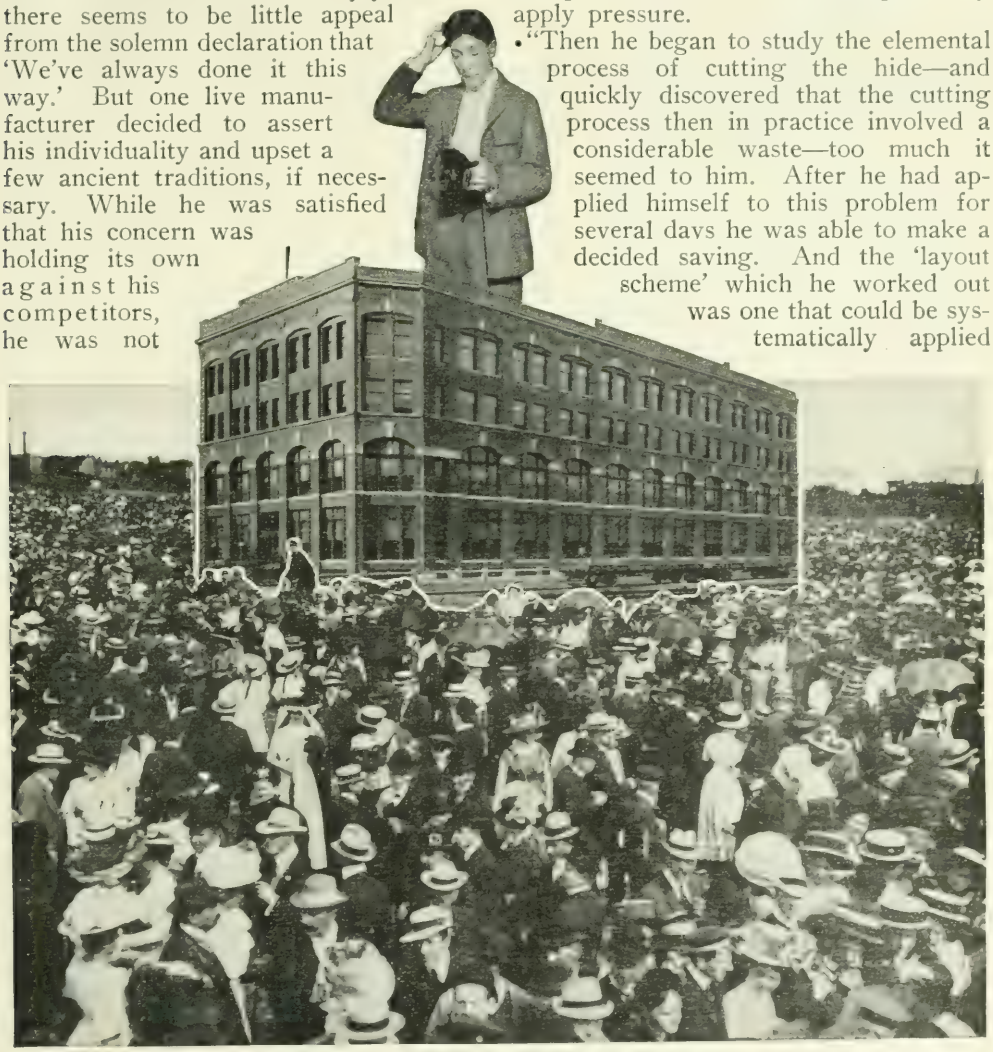
"About the best advice that can be given to a young manufacturer—or an old one, for that matter—is: Never lose sight of the Ultimate Consumer; keep close to him at every stage of the game: meet his needs, whims and demands; follow your goods into his hands and study the reception and use that they meet with there; let him be your guide and critic; please him and the jobbers, the wholesalers, the retailers and every kind and stripe of middleman will have to buy your goods.

"Of course it would be foolish to assume that the consumer is not considered in a way, by every manufacturer—but generally that consideration is given at too great a distance. The tendency of the manufacturer is to feel that the wholesaler or the middleman to whom he sells his product is the fountain of wisdom on that score. He ought to be—but in hundreds of cases he isn't. The only safe way is for the manufacturer to get his education at first hand from those who use his product—and to educate the users of his product as to its special

merits. If he can do this he is on the road to big success.

"Because an industry is generally affected with a certain kind of dry rot in practice and tradition, it does not follow that this need be fatal to an individual going into that line—but he should know what that difficulty is beforehand and face it squarely. If he has the genius of resourcefulness he may overcome that chronic trouble. I have seen this done repeatedly. For example, the leather belting business is afflicted with traditions of craftsmanship. The processes have been established for many years and there seems to be little appeal from the solemn declaration that 'We've always done it this way.' But one live manufacturer decided to assert his individuality and upset a few ancient traditions, if necessary. While he was satisfied that his concern was holding its own against his competitors, he was not satisfied with a business that returned only a meager margin of profit on the investment. Where could he do something new and different that would give him a distinct advantage? The selling and financial departments of his business were ably and closely managed and seemed to offer little opportunity for improvement. Then he put the production end under the microscope to see if he could find any soft spots. This led him, first, to the general conclusion that craftsmanship was the most flexible element in his factory and that here was the point at which he could profitably apply pressure.

"Then he began to study the elemental process of cutting the hide—and quickly discovered that the cutting process then in practice involved a considerable waste—too much it seemed to him. After he had applied himself to this problem for several days he was able to make a decided saving. And the 'layout scheme' which he worked out was one that could be systematically applied



THE MANUFACTURER SHOULD ALWAYS KEEP IN VIEW THE ULTIMATE CONSUMER AND HIS NEEDS. THE GOODS SHOULD ALWAYS BE FOLLOWED INTO THE CONSUMER'S HANDS.

to the cutting of every hide that was used in the business.

"But when he explained it to his cutters he was met with pitying looks. What, cut a hide in a new way? The fathers and grandfathers of some of his cutters had been belt cutters; they had been boss cutters in England and to depart from the rules that they had followed and passed down in the family was not to be thought of. However, he was determined to put his scheme into effect —and was wise enough to realize that he could not make it a real success without the genuine co-operation of his workmen. This shifted his problem to the means by which he could secure their support. At last he hit upon the idea of a 'waste bonus'—of offering a premium for the reduction of the scrap pile. This bonus was carefully figured out, but in effect it was simply giving the workmen a share in the saving that they could effect by greater skill and attention in utilizing a larger proportion of each hide that passed through their hands. After this system was fully developed and running smoothly it effected a gross saving of twenty thousand dollars in a single year.

"I'm certain, however, that the average manufacturer gives too little attention to waste saving. Many a factory is putting a respectable fraction of a dividend into the scrap heap. Because certain material has always been considered as waste, the tendency is to keep on treating it as waste."

Uphill

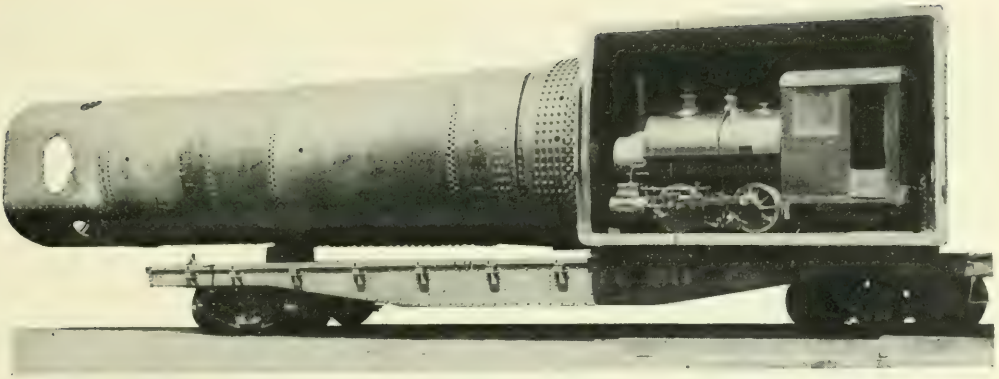
Does the road wind uphill all the way?
Yes, to the very end.
Will the day's journey take the whole long day?
From morn to night, my friend.

But is there for the night a resting-place?
A roof for when the slow dark hours begin.
May not the darkness hide it from my face?
You cannot miss that inn.

Shall I meet other wayfarers at night?
Those who have gone before.
Then must I knock, or call when just in sight?
They will not keep you standing at that door.

Shall I find comfort, travel-sore and weak?
Of labour you shall find the sum.
Will there be beds for me and all who seek?
Yea, beds for all who come.

—Christina Georgina Rossetti.



DINKEY ENGINE INSIDE THE BOILER OF THE WORLD'S MOST POWERFUL LOCOMOTIVE.

WORLD'S MOST POWERFUL LOCOMOTIVE

HERE is the boiler of an American Mallet compound locomotive, said to be the largest locomotive in the world. The illustration shows a dinkey engine placed inside the firebox of the immense boiler.

This locomotive, which has 115,000 pounds' tractive power, outclasses even the largest locomotives of recent construction.

HOUSE WRECKED BY GAS EXPLOSION

THIS is the result of the freakish work of a natural gas explosion in Cincinnatti.

Just what made the gas explode is not known, but the family of five people retired for the night late in the evening and left the kitchen gas range lighted to take off the chill from the downstairs rooms. The crash came about midnight. The family found themselves thrown from their beds and surrounded by a debris of bricks, mortar and plaster. There were no side walls standing to their home and part of the rear of the house was also blown away. After they had gathered themselves up they found that not even one of them was hurt, yet they were amid the wreckage and falling walls. That the entire building did not collapse after the explosion is considered miraculous. A piano downstairs was carried six feet by the force of the explosion and is seen overturned in the wreckage.

The building was so badly damaged that it had to be razed.

THE RESULT OF A GAS EXPLOSION.

NEW CAPITOLS IN THE PHILIPPINES

OUR government in the Philippines is erecting new reinforced concrete capitol buildings in nearly all the provinces forming the Philippine archipelago. As there are nearly half a hundred of these provinces, which correspond in a small way to our States, the magnitude of the undertaking may be easily imagined.

When the United States took charge of the islands, most of the provincial buildings were found to be in a bad state of repair. Many of them were built decades ago, and as the ma-

terial was generally of limestone or hardwood, the process of decay was rapid.

Of course the leading provinces,—those that could best afford new provincial homes,—undertook new construction before the others. But where the provincial treasury has not been able to meet the expenditures, the insular government has stepped in to help out. The buildings are not only constructed to withstand time and the elements, but they are handsomely designed and elaborately equipped. La Laguna, a province near Manila, was one of the first to build a new capitol, and since then many other provinces have followed suit, many of them outdoing La Laguna's building in size and appearance.

The result will be to set a new standard of architectural taste for the whole archipelago.

TYPE OF PROVINCIAL CAPITOLS NOW GOING UP IN THE PHILIPPINES.

WHERE BEES ARE RAISED ONLY TO KILL THEM.

RAISING BEES TO KILL THEM

UNCLE SAM has a lot of beehives—nearly a hundred of them all filled with bees—and gets nary a drop of honey. This is not because he doesn't know how, but because he doesn't want to. He is in the business solely to raise bees and then to kill them with some ailment.

These hives are located out at Chevy Chase, a fashionable suburb of the capital, and under the system outlined, are increasing rapidly. Bees, like all other creatures, have their diseases, and it is necessary to study them in order to know how the beekeeper may meet the numerous problems which beset him.

Of course the government has other hives where the honey problem alone is given close study. Of the millions of pounds of honey produced each year, fully seventy-five per cent is used in the baking industry. It has been found by bakers that by using honey for sweetening purposes instead of sugar or glucose, cakes and other sweets will keep fresh longer and have a better flavor.

SARATOGA CHIPS FOR THE COWS

A CALIFORNIA rancher, who has an experimental farm near Van Nuys, has discovered a way to utilize potatoes

that are unsalable either because of their small size, irregular shape, or because of damage received in getting them out of the ground. Indeed, potatoes which have been attacked by some forms of pest are not absolutely worthless, according to this man's statement, as they can be converted into an excellent stock fodder by a simple method.

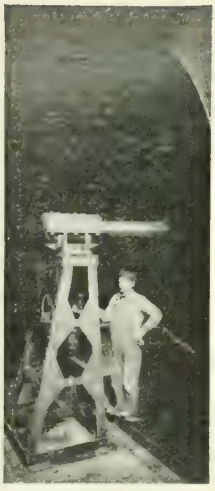
The device consists of a small slicing machine driven by a little gas engine, although an electric motor would answer the purpose as well. The unsalable potatoes are simply dumped into a hopper at the top and delivered in thin slices similar to Saratoga chips. These are spread on flat trays and set in the sun to dry, a brief process. Then they are treated with a chemical solution and ready to be stored in a dry place for winter feed. The chips will keep indefinitely and when moistened will come back to their original tenderness and make an appetizing and fattening fodder.

In preparing them for shipment they are ground to a very coarse meal as they are more easily sacked in that form and occupy less space. The potato chips make good chicken feed also, as they are fattening.

HUGE FAN FOR FRESH AIR

THE twenty-foot ventilating fan shown in the photograph is used in connection with the air-purifying system in one of the cotton-mills at New Bedford, Mass. It is asserted that this is one of the largest fans ever built. It stands 21 feet 8 inches above the floor level. It has a total height, from top of housing to bottom of the discharge, of 34 feet; the blast wheel is 20 feet in diameter.

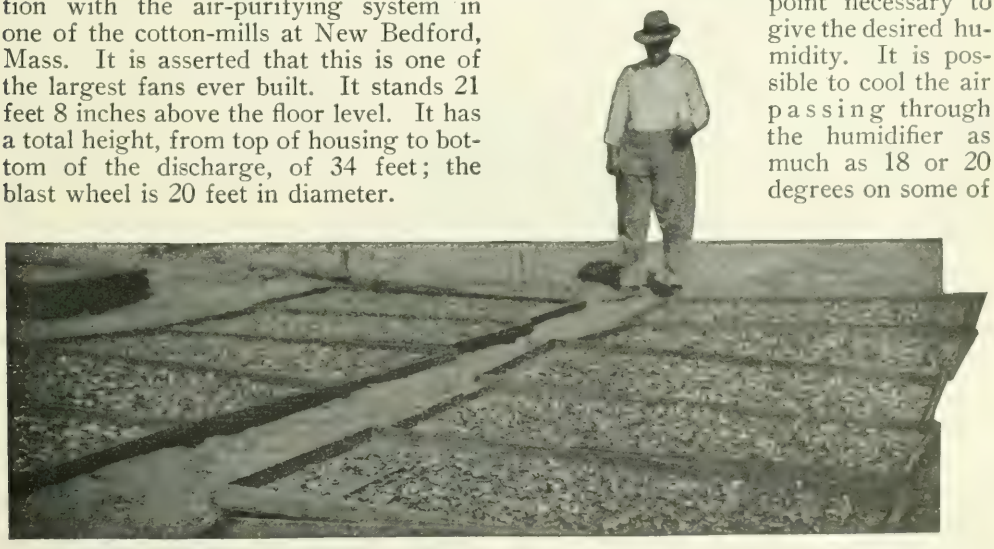
The fan revolves at the rate of seventy revolutions per minute, supplying 20,000,000 cubic feet of air per hour. The diameter of the shaft is nine inches in the bearings, increased to ten inches between the bearings, and it is driven by an engine capable of 125-horsepower capacity.



HUGE VENTILATING FAN FOR FACTORY.

The air in being drawn through the humidifier comes in contact with a spray of water from 1,600 nozzles under pressure from a centrifugal pump. During the warmer months of the year, the air is cooled in passing through the humidifier by the evaporation of the water, down to the wet-bulb temperature of the entering air, and is saturated at that temperature.

There is sufficient air delivered to each floor by the distributing system of ducts to absorb the heat generated by the machinery and the heat transmitted through the walls and windows on that floor and to bring the temperature down to the point necessary to give the desired humidity. It is possible to cool the air passing through the humidifier as much as 18 or 20 degrees on some of



DRYING POTATO CHIPS ON TRAYS FOR STOCK FEED.

the hot, dry days of the summer.

It is a most humane invention, and its use should do much to alleviate the condition of the employes in the close quarters of cotton mills and factories everywhere.

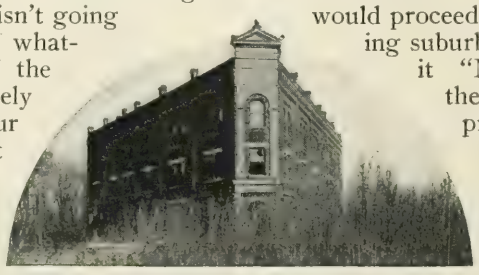
HARD ON THE HORSE

HERE is the sort of scene one may still see in even so westernized a city as Mukden. Mukden, it will be recalled, is in Manchuria. It is on the railroad line between Port Arthur and Harpin, in a region forever made famous by the events of the war between Japan and Russia.

CHINESE PUTTING SHOES ON A HORSE IN MUKDEN.

The illustration gives an epitomized conception of the tremendously backward condition of the people. The method of shoeing a horse is one that was used in the days when the Tartar hordes swept time and again over this fertile region. Evidently the shoer isn't going to take any chances whatever. The head of the animal is tied securely to the post, its four limbs are brought together and fastened in a true lover's knot, and the assistant adds his stabilizing strength to the whole.

More trouble and pains appear to be taken in trussing up this horse than would be employed on our Western plains in branding. But the old order puts up a big fight—the fight of inertia—before the new order of speed and efficiency may reign.



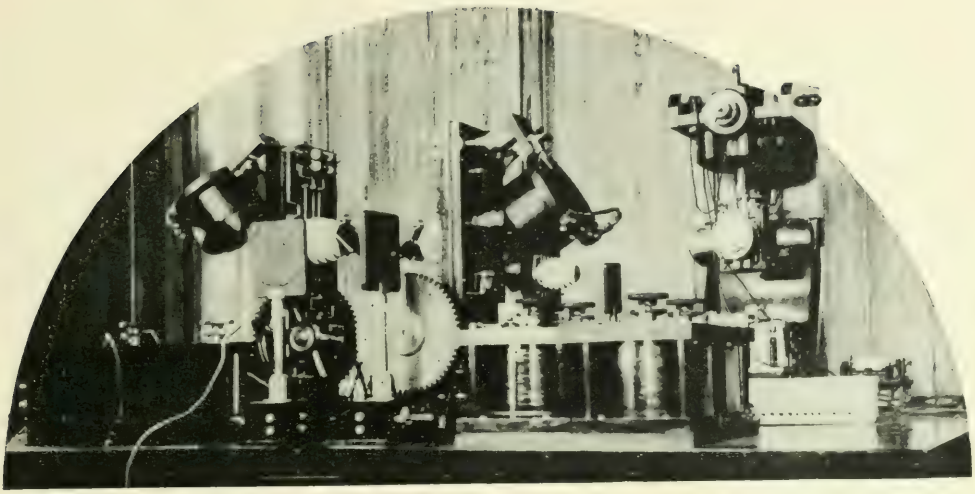
A RELIC OF KANSAS CITY'S BOOM DAYS. THE "MIDWAY BLOCK."
It is to be an actual "Midway" in a new made-to-order city.

BUILT YEARS TOO SOON

IN the right place, but built twenty-three years too soon is that relic of Kansas City's "boom days," the "Midway Block." For twenty years it has stood in tenantless isolation surrounded by corn fields and weed patches — a satire on its name, "Midway" between nothing but fields and river. Now, by a strange trick of fortune, it suddenly becomes worth as much as when it was built, for a combination of powerful corporations, instead of one of the business world's dreamers, has control of its fate.

The 3,500 acres in which the block is a centerpiece are just across the Missouri River from Kansas City. Nearly two years ago it was suddenly discovered that packing interests were in control of nearly all this acreage. The announcement followed that the new owners would proceed to build a manufacturing suburb on the land. Naming it "North Kansas City," they got out their blue prints and without any more ceremony set to work.

To protect the new city from flood, they built around it a levee eight and a half miles long and twenty-five feet high; to open it to traffic, they constructed, on some abandoned piers — other monuments of boom day enterprise—a half-million dollar bridge. These preparations completed, the surveyors now are cutting streets and staking out factory sites.



INSIDE THE STATION OF THE NEW YORK TO BERLIN WIRELESS, AT SAYVILLE, L. I.
The sound intensifier is shown at the right. The receivers are the latest type of Telefunken standard.

NEW YORK TO BERLIN WIRELESS

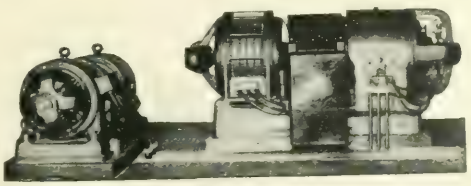
By

P. HARVEY MIDDLETON

ABOUT the time you read these lines, New York City will have begun to talk by wireless with Berlin, thirty-five hundred miles away—a distance far greater than any hitherto covered. Outside the village of Sayville, Long Island, a five-hundred-foot tower stands, part of the equipment of the powerful wireless station destined to be the first aerial link between the United States and Continental Europe. At the town of Nauen, a suburb of Berlin, there is under construction a similar tower, even higher than that at Sayville, and, with this completed, these two stations will be in direct communication with one another.

The station at Nauen is being built by the German Wireless Telegraph Company, better known as the Telefunken system, a powerful German rival of the Marconi concern, with a capital of something like two hundred millions of dollars. The American branch of this German system is the Atlantic Communication Company, New York, incorporated about a year ago to handle the operation of wireless stations in the United States under the Telefunken system. This company will have the direction of the Sayville plant, which is already open for public service.

The sending tower at the Sayville station, a shaft of steel, instead of having the customary flaring base, actually comes to a point at the bottom. The weight of the tower rests upon a ball and socket joint, giving the flexibility needed to enable it to resist the tremendous wind stresses to which the structure is subjected at times. Therefore, the ground simply carries the weight



GENERATORS USED AT THE WIRELESS STATION AT SAYVILLE.

of the tower, which is held vertical by long steel linked guys fastened to six heavy concrete anchorages, placed in circles around the tower. This method of construction also greatly reduces the amount of iron required. From the tip of the steel column radiate the aerial wires — antennae — which serve to absorb or send out the electric waves, and which terminate at short poles placed in a wide circle around the base of the tower, forming a kind of immense umbrella which covers the greater part of the two hundred acres of land owned by the American company.

The Station at Sayville.

The equipment of the Sayville station consists of two complete Telefunken outfits—one high power set for the long distance work, and one smaller set for the shorter ranges. The company is, therefore, in a position to accept messages for ships as far out as four days from New York.

A private wire between Sayville and a central station telegraph company in New York serves as the junction between the wireless system and the land lines, so that a message can be quickly sent from any land telegraph office to Sayville and thence to the ship in question, or *vice versa*. The Sayville station is also taking part in the wireless weather service which the United States Weather Bureau is inaugurating. By this arrangement, ships at sea send and receive at regular intervals reports on weather conditions and storm warnings.

One of the interesting pieces of apparatus at Sayville is the Telefunken quenched spark gap, consisting of a series of metallic plates placed in a row at minute distance from one another. This form of gap, when used with a high frequency alternating current, produces in the telephone, in which the incoming signals are received, a high musical note instead of the ordinary clicks. This has the advantage of making the signals more easily distinguishable from the customary incidental noises often noticeable in the telephone receiver, due to electric disturbances in the atmosphere, which are known amongst wireless operators as "static." The quenched spark gap also permits of sharper tuning, thus causing less interference between stations together sending separate messages. A small vibrating device at Sayville makes it possible for two operators to receive simultaneously two different messages having different wave lengths.

Another unusual instrument at the Sayville plant is a sound intensifier. This is really a system of relays, microphones, and resonators, which magnify the incoming current so that a signal barely audible in the ordinary telephone receiver may be heard all over the operators' room, very much like the sound caused by the tapping of a piano key.

THE WARDEN'S OFFICE,
KANSAS STATE FISH HATCHERY.

FISH ON EVERY FARM

By

HARLAN D. SMITH

THIS is a true fish story. Kansas, far inland, oceanless, lakeless, also "dry," has just spent $125,000 for the largest fish hatchery ever built and has declared its intention of becoming a fish state. The opening of this gigantic hatchery October 29 was the beginning of the realization of a vision—a public servant's vision of cheaper living for his people.

Lewis Lindsay Dyche, state fish and game warden of Kansas, had a dream. He dreamed that the rivers and streams of his state were alive with fish—fish that were good to eat. He dreamed that he saw his fellow-countrymen lined along the banks of these streams and pulling out these good fish by the thousands, and using only poles and lines. They were just ordinary people he saw, not fishermen, and they all were having the best of luck. He dreamed that he looked in on the family boards of the state and saw fish on every table. On every farm he saw a small pond stocked with the best native fish—crappie, black bass, catfish, and sunfish. The meat bill of Kansas people, so he dreamed, had been cut in two by the popularity of fish. High-cost-of-living stories were no longer among the live ones.

Then he awoke. And it was such a pleasant dream, and so plausible that he pondered over it awhile. It was not a dream of impossible things, he told himself. So he began to plan a little. Later he planned big. He would make his dream come true. He would build a big fish hatchery and raise enough fish to stock all the streams and private ponds in the state. He would make fish so common in Kansas that it would replace beef and pork on the table, in part at least, and thereby reduce the state's meat bill a few million dollars a year.

Then he went to Washington to show his plans to the government fish experts. He wished to know if his project was too large. To the office of George W. Bowers, commissioner of the United State bureau of fisheries, he carried his plans and his enthusiasm. That official was amazed at the immensity of the undertaking that was explained to him. The Dyche blue prints showed a hatchery covering 160 acres of artificial ponds—eighty-three in all—costing $125,000. None of the government hatcheries cost

more than $25,000. In fact, the commissioner said, no country on the globe ever had undertaken fish-raising on so large a scale. But he found no fault with the project. Rather, after his surprise, he was quite in favor of it.

So back to Kansas came the fish and game warden with his blue prints, and built his hatchery. He will pay for it from the hunters' license fund which amounts to some $60,000 annually. Before being allowed to shoot even a rabbit, a hunter in that state must have a license which costs one dollar a year.

The new hatchery is at Pratt, in the southern part of the state. Thousands were at the formal opening in October to see the water turned into the 160 acres of ponds. To get water for these ponds a concrete dam 500 feet long was built across the Ninnescah River, which is near. This furnishes a supply lake of seven acres. The water is taken from here into the ponds more than a mile away through a 21-inch clay pipe which delivers the water at the rate of three and one-half million gallons a day. The water system, controlled by more than a hundred concrete structures with bronze and iron gates, is the most complete equipment for handling water that has yet been devised for a fish hatchery. In fact all the equipment for the hatchery is complete and modern throughout.

A building which will contain offices, a library, and an aquarium laboratory, costing $20,000, is being built. In addition, a small power house, a home for the warden, and several houses for attendants will be built near the hatchery. Around the grounds and between the ponds are drives. In all it will be made an attractive place to visit and it is expected that thousands will come to see it every year.

"Kansas must have cheaper meat," declared Dyche, recently. "Men who are working for $1.35 to $2 a day and who have families to support can scarcely afford to eat beef, pork, or mutton even once a day. As I see it there is very little chance that staple meats will ever be any cheaper. It is simply ours to find a cheaper meat that will take the place, in part, at least, of the high-priced beef, pork and mutton. Fish, I believe, is that meat. It's wholesome and generally liked, easily and economically produced, and may be made plentiful. Before I am through with this thing I hope to have fish selling in Kansas markets for eight cents a pound.

"I want fish to be so plentiful in this state that any man, woman, or child can go out to his own private pond or down to the nearest stream and catch a string of fish for dinner using the most ordinary kind of pole and line." With such conditions Professor Dyche's highest hopes will have been realized. Dyche gained his title of professor as curator and teacher of zoology in the University of Kansas.

"Catfish instead of steak; crappie instead of pork chops; sunfish in place of veal and mutton chops—and the people of Kansas will be healthier, richer, and happier. There is nothing on this beautiful earth better to eat than a channel catfish fried brown. Anybody who has eaten one knows that. Even German carp, much despised, is mighty good to eat when it is cooked properly. I should like to conduct a tour of education on the art of cooking German carp. I would redeem that fish from the stigma sportsmen have cast upon it."

Catfish, crappie, black bass, and sunfish will be the principal kinds bred and sent out from the Kansas hatchery. Fish of these breeds will do well in any of the streams of the state. It will be possible, Dyche believes, to produce 10,000 fish on every acre of the hatchery every year. That means more than a million and a half as the annual output from the 160 acres in the hatchery.

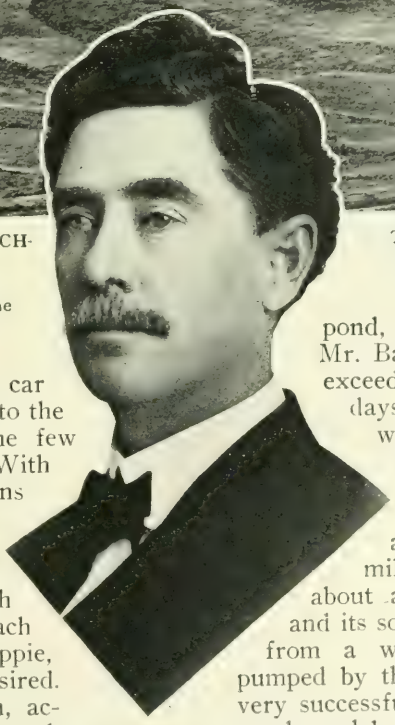
A fish car belonging to the fish and game department which can be attached to trains and operated over every railroad in the state will be used to distribute the fish. Heretofore the fish car made only one trip every year. With only eleven ponds in the old hatchery one trip was enough. Now, with the increase of eighty-three ponds, the fish car will be kept on the road most of the time.

Fish are sent free to anyone in the state. Application blanks are sent from the fish and game department on request. The principal item of information desired in the application is the size of the pond in which the fish are to be kept. The warden then knows how many fish are needed to stock the pond. Two men

GOING TO THE STATE FISH HATCHERY TO SEE THE WATER TURNED ON.

A concrete dam—500 feet long—holds the water in leash from the supply lake.

THE EXCAVATION FOR EIGHTY-THREE FISH PONDS.



KANSAS' GAME WARDEN—LEWIS LINDSAY DYCHE.

accompany the distributing car and hand out the cans of fish to the waiting applicants during the few minutes that the train stops. With every consignment directions for the care of the fish are given.

Last spring 1,728 private ponds were stocked with fish by the game warden. Each owner got sunfish, bass, crappie, catfish, or perch as he desired. Twenty to one hundred fish, according to the size of the pond, were given to each.

"It doesn't require much of a pond to raise fish," said the Kansas fish and game warden recently. "I have seen good fish reared in a water tank. Any farmer that will give a few days' time during the dull season can build a small pond at slight expense. I have in mind one pond near Pratt. Sam Bailey's pond, which was built by Mr. Bailey at a cost not to exceed $25, or about five days' work for a man with a team, a plow and a scraper. Of course this did not include the cost of a pump and a windmill. This pond covers about a fourth of an acre and its sole supply of water is from a well. The water is pumped by the windmill. It is a very successful fish pond and is a good model for the farmer who wishes to raise fish for his own table. It was stocked with crappie and yellow catfish not long ago. Bailey also uses his pond to irrigate his garden on which he grows several hundred dollars' worth of produce every season.

"A pond is valuable on any farm. It is useful for purposes other than fish-

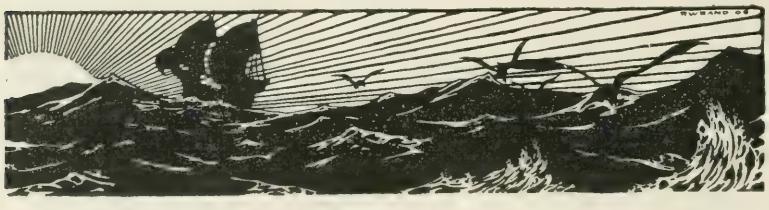
raising. It may be used as a watering place for stock, and in many places where the water supply is sufficient could be used to irrigate gardens, berry patches, and even orchards. And a pond situated in a pretty grove of trees might be made a source of much pleasure for family and neighborhood picnics. Or, if the pond or lakes were an acre or more in size, there might be an ice house near the shore where a supply of ice sufficient for the summer could be put up in winter at small expense. A boat could be kept on the water, and a small building might be constructed near where the boat and such articles as fishing tackle, bathing suits, skates, and other supplies could be housed for protection and safekeeping. Such uses of the pond add much to the interest and enjoyment of life on the farm and help very materially to solve a rural problem that is bothering thinking people.

"With the added stimulus which the new hatchery will give to fish-raising in this state I expect a thousand ponds to be built in the near future. Artificial ponds will become popular in any community once they are introduced. Near Medicine Lodge, Kansas, there are twenty fish ponds now and only a few years ago there were scarcely any. The department of fish and game will send complete instructions for making a pond to anyone."

The state of Kansas is encouraging the building of ponds and the stocking of them with fish. The 1911 legislature passed a law exempting twenty acres of land from each farm from taxation each year if a pond covering one acre were built on the farm. The exemption is double if the pond is built of stone, brick, or cement, while the ordinary exemption holds if the pond is built of a dirt embankment. This is done for two purposes: to encourage the building of ponds to retain the surface waters from adjoining lands and to encourage among the farmers the raising of fish for home consumption.

Some Kansas farmers who are raising fish only as a side line are making it quite profitable. John Catte, of Langdon, has ponds covering fifteen acres in which he rears fish, principally black bass. He fills orders for these bass from all parts of the country. This year he has sold more than $700 worth and has orders for more. Another man, S. W. Muenzenmayer, of Woodbine, has built a small summer resort for his family around his fish pond. He has a roomy summer house—where the whole family lives during the hot weather—boats and other camp comforts.

Another farmer who has tried the Dyche plan and found it very successful is Frank Bridgeman, of Bentley. His pond is fifty feet wide and two hundred feet long, and ranges in depth from one to five feet. He stocked his pond four years ago and now has channel catfish that weigh two pounds, river catfish that weigh four pounds, bullhead catfish that weigh from one to one and one-half pounds, and carp that weigh six pounds. He catches what fish the family wishes to eat in two weeks and keeps them in a "live box" in the pond until they are needed. Fresh fish is at hand for this family whenever desired.



THE DIVER'S SLED.

AUTO SLED TO AID DIVER

ADVANCE in the diver's art has again been made by the adoption of automobile traction for the man venturing into the ocean's depths. A firm at Lübeck, Germany, has designed a submarine sledge—connected with and propelled by a motor boat—upon which the diver on his strange journey is seated most comfortably. He may steer his vehicle upward and downward, in fact, in any direction. A protective shell behind the diver's seat is an efficient safeguard against submarine water currents set up by the swift motion.

The diving outfit used in this connection comprises a potash cartridge, which for about three hours regenerates the air breathed out by the diver. When its capacity is exhausted, the diver should, of course, return to the surface in order there to take in another cartridge. At the sides of the sledge are tanks filled with compressed air from steel cylinders, which are used in steering the sledge down to considerable depths. An elevation rudder serves for diving up and down under way, and a horizontal rudder is provided at the rear, for describing any curves desired. With full daylight, no artificial lighting is required for exploring depths of about 130 feet; otherwise a submarine lamp should be carried, or the sledge should be provided with a search-light fed from the motor boat. The inertia of the water effectually damps any shock on striking the bottom.

EMERGING FROM OCEAN'S DEPTHS ON A SUBMARINE.

The adoption of this strange vehicle may give rise to the advent of a new sport, comparable in many respects to aviation.

TOBACCO SAVES GRAPES.

The top photo shows an unsprayed vine, in Northeast County, Pennsylvania, injured by leaf hoppers; the lower, a vine sprayed with tobacco extract (2.7 per cent nicotine) to protect against the pest.

OCTAGONAL OR EIGHT-SIDED TENTS—ONE OF THE BEST FORMS FOR OUT-DOOR SLEEPING —IN USE AT THE UNION PRINTERS' HOME, COLORADO SPRINGS, COLORADO.

TOBACCO SAVES GRAPES

TOBACCO, which when used to excess, is most harmful to mankind, is often made a blessing when put to the right purpose. Scientists have come to recognize the fact that in the control of plant and animal diseases tobacco or a derivative of it—nicotine—is a most valuable agent.

Not long ago Uncle Sam was appealed to by grape growers of Pennsylvania for help because of the ravages of some insect which was destroying their vines. In many of these vineyards because of the attack of this insect—the grape leafhopper—the vines were becoming noticeably weaker each season and the yield of fruit was being greatly reduced.

Scientists of the government worked for two whole seasons in the afflicted region, using many well-known insecticides, but it was found that two forms of tobacco extract, one containing 2.7 per cent of nicotine and the other 40 per cent of nicotine sulphate were very efficacious. Both of these substances killed the bug when hit by the spray.

In one vineyard twenty-five acres were sprayed with the 2.7 per cent solution and as a result of this treatment the foliage of the vines remained green throughout the entire season, and the vines made a very heavy growth of new canes. The berries and clusters of fruit were large and of good quality. A record was kept of the yield of the vines for three years. The first year when the insects were creating much havoc the yield of fruit was 262 eight-pound baskets to the acre; the second year when the experiments were first conducted, 423 eight-pound baskets an acre were secured; while the third year 796 eight-pound baskets an acre showed the wisdom of the use of the nicotine solution as a means of keeping the insects in check. The price secured for the grapes the third year was a cent less per basket than for the first year, but the income per acre for the third year was nevertheless $50.78 more than for the first year.

MODEL LIVING TENTS

THESE fresh air tents at the Union Printers' Home near Colorado Springs are considered models of their kind. They are situated on the grounds just outside the main building and are occupied by men suffering from lung trouble. They are octagonal in shape, made of heavy sail cloth and have ventilation in the top near the apex and in each side of the hardwood floor. Eight ventilators are cut in the floor, and arranged so that a trap-door can be closed over them. The open space is covered with wire netting to keep out insects. These ventilators and the one in the apex of the roof are operated by means of chains which can be reached from the bed or other places in the room. A washstand and bureau is built around the middle pole and the rooms are fitted with beds, chairs, and many comforts.

ENGLISH PHEASANTS ON THE WINTER "RANGE."

PHEASANT FARMING IN AMERICA

By

JOHN TRACY

OUR native game birds are rapidly becoming extinct, and we have been obliged to resort to preserves stocked with European pheasants, to meet the taste of the epicure. It is a commercial certainty that within a few years the demand will call for a supply of hundreds of thousands—even millions of these fine-flavored fowl.

Wallace Evans, the most extensive pheasant raiser in the world, started his business in the back yard of a crowded Chicago suburb; today his plant occupies five hundred acres and his sales of birds and eggs is largely a car-load traffic. In Belgium, where the "fancy" or "show" varieties of pheasants are raised to an extent unknown in any other country, this occupation is a family affair, operated on a small scale but in a highly specialized form. There it is conducted strictly for profit—the Belgium housewife does not toil for fancy pets—and many a poor but numerous family in that country is clothed from the proceeds of the pheasant pens in the village back yard or on the tiny farm.

There is one cardinal qualification for success in this queer kind of feathered farming—and that is a genuine love for it, which always carries with it a knack for handling the birds and making them thrive. Without this asset one would better keep out of the business. Genius has been defined as an infinite capacity for taking pains. If this definition is correct it requires genius to make a success of pheasant raising, for it is a business of small but important details. Their neglect leads to failure; their conscientious and unfailing observance is practically a guaranty of success so far as the

production of birds is concerned. That, however, is only half the battle. Finding a market is the other half. A staple product is always easy to market, at least at a going price; the producer of a commodity that is comparatively rare and little known must be as clever in finding a market for his product as in producing it. The amateur pheasant raiser will do well to consider this phase of the business before entering upon it.

With these qualifying features in mind it may be said that many a man, woman, or boy who is looking for an interesting side line that may be conducted on the grounds of a village or country home might find pheasant raising both pleasant and profitable. It is especially well adapted to the circumstances of the home woman or the man who is practically retired from the hard struggle of bread-winning, or to the professional man in the small town who would like to combine a fascinating diversion with a modest profit.

Wallace Evans, the young proprietor of the five-hundred-acre game farm on the outskirts of River Forest, Illinois, one year sold thirty thousand pheasant eggs and his hatch of young birds for the season was not less than six thousand. For the last few years he has had a demand for fully six thousand pheasants a year for breeding purposes. For these

"SILVERS" ARE STRIKING IN APPEARANCE.

he has received, in wholesale lots, an average price of six dollars a pair.

When asked how he came to enter this strange business young Evans replied: "By inheritance, I guess! My father was born in Wales and spent his boyhood there. I suspect that he spent a considerable part of it practicing all the tricks of the poacher's art on the game-keepers

LADY AMHERST AND REEVES PHEASANTS.

of the big estate about his old home. The game-keeper who can keep ahead of a Welsh poacher is certainly a master of his calling. At any rate, as a youngster I loved to hear father tell of the scrapes and adventures of his boyhood poaching days. Probably a love of pheasants and game birds was in my blood. Anyhow, when I was a small boy in grammar school I asked father if I might not get some pheasants and try to raise them. He consented—secretly he was as enthusiastic about them as myself—and we secured a few imported birds and began to breed them in a back-yard pen.

"I was rather frail and this pastime kept me out of doors and off the streets. No doubt I owe my present robust health to the fact that, as a youngster, I took up the 'fad' of pheasant farming. Through many discouragements I learned the art of caring for them and by the time I was ready to leave school my flock had increased to such proportions that I was compelled to find a farm. At first a hundred acres was too large; today five hundred acres is none too big. The business is growing every year and I feel that it is only fairly started."

This view of the matter is easy to understand when one has a knowledge of the conditions upon which the pheasant business relies for its support. Only a few years ago "prairie chickens" were plentiful in all the states of the Middle West; partridges were common in the woods of almost any state and quail abounded over an immense section of the country. Today every state has stringent laws restricting the shooting of all these birds and these laws are aggressively enforced. Prairie chickens are so scarce as to be called practically extinct by the sportsmen who once hunted them at will—and had the thanks of the farmer for ridding his wheat and corn fields of them. Partridges have also become scarce and quail are few and far less common in most country localities than they once were.

But the instinct of sportsmanship is still strong in men and demands a fair opportunity to satisfy itself. This demand has made itself felt among the lawmakers of the various states—with the result that scores of commonwealths have made appropriations for the distribution of game birds for the purpose of stocking the woods and prairies with a new race. The success of the ring neck pheasant as a stock bird on the great private estates in England at once put the pheasant into the front rank for this purpose—with the Hungarian partridge as a close second. When a state buys birds, or eggs, or both, to the end of making its prairies and woods abound with these splendid game birds, it buys by the thousands—and generally replenishes its stock from year to year. Here is the secret of the main demand which has expanded the business of Mr. Evans from a back-yard coop to a five-hundred-acre farm. But there is still another demand of which the smaller pheasant farmer should not lose sight—a demand that is constantly and rapidly increasing.

Owners of "estates" and of less pretentious "country places" have—by the

hundreds—come to feel that their acres are not complete without the presence of game birds—not to afford shooting for themselves and their friends, but because they enjoy having the birds about. Again, there are many who feel that a thing which is an established part of every country house in England cannot be ignored by the American who wishes his estate to have every desirable feature.

Private buyers of this kind, and even those who are fanciers and have no estate to stock are, in the opinion of Mr. Evans, the coming market for the smaller pheasant raiser who has not the stock to meet the demands of a state. This private market is to be found and cultivated by means of "blue book" lists and by small advertisements in magazines and publications especially edited for the owners of country homes. Small numbers of birds should and do bring higher prices than large shipments. Sold in this way they should command at least six dollars a pair for ring necks, fifteen dollars for silvers, fifteen dollars for goldens and thirty dollars for Amhersts.

Of these the ring necks only are game birds. The others are purely "show birds" and are in demand as ornaments to country places and for display in parks, museums and shows. Again, the amateur pheasant raiser should not forget the taxidermists. Lists of these may be readily obtained. While this market is not large, it is worth cultivating, especially since it has become common for public schools to buy "specimens" of birds for small school collections.

One alert milliner in Chicago has established a precedent which should not escape the attention of pheasant raisers. She is known among the fashionable women of her trade as "the pheasant milliner" because of her specialty of hats made from the skins of English ring neck pheasants. Here is a market which might well be established in almost any community—for a pheasant hat is decidedly "smart," as any woman will tell you.

In the opinion of Mr. Evans, however, one of the best opportunities for the small pheasant raiser lies in the direction of stocking a small woods, near any city of considerable size, and renting shooting privileges after the English fashion. He declares that city sportsmen are "starved" for sport; that they would eagerly pay a high price for the chance to go less than a hundred miles from their business and get a bag of these magnificent game birds.

So much for the market—which should always be considered first. Now for the art of raising the birds.

"I would not," says Mr. Evans, "advise an amateur to attempt starting a flock of pheasants from eggs. Better begin with a few birds—six hens and a cock, for instance—which should be bought and introduced into their new home in the fall. Why? Because eggs are sensitive to shipment and because the birds will breed with more certainty in a place to which they are accustomed than in one to which they have just been introduced. Again, birds are disinclined to breed immediately after they have been shipped. This is the reason why imported birds should never be bought for immediate breeding purposes. Get Ameri-

Feeding Time.

"GOLDENS," "SILVERS," "REEVES" AND "AMHERSTS" IN WINTER QUARTERS.

can raised birds every time; otherwise you court failure, at least for the first year. As a ring neck lays about sixty eggs in a season, under normal conditions, the increase from six hens should satisfy any beginner."

The two most commonly fatal enemies of the pheasant are vermin—rats, mink, weasels and skunks—and dampness. For this reason the pens and coops should be placed on a dry and well-drained spot and should be made vermin-proof. Runways should be surrounded with bottom boards sunk six inches into the ground and the poultry netting should be of too small a mesh to permit a rat to crawl through. Two or three wire traps set tight against the bottom-board on the outside will soon prove how attractive pheasants are to these pests. A coop and runway large enough for a dozen white leghorns will be sufficient for half that number of adult pheasants. One of the details on which experienced pheasant breeders lay great stress is the handling of the eggs, which are peculiarly sensitive. When the laying season opens—about the middle of April—the breeder should be provided with a set of shallow trays, made of thin box stuff and filled with clean, dry sand. Gather the eggs late each evening and at once place them in the sand with the pointed end down. Do not be stubborn and insist that it makes no difference on which end the eggs are started—for it does; results will prove that if you insist. Turn them once each day, being careful that one egg does not touch another. These trays of eggs should always be kept in a rack in a room which is cool and moist at all times.

The hen pheasant should never be allowed to set. The offices of incubation should be delegated to a domestic hen of light weight and abundant feathers. A bantam of the fluffy or Cochin variety is the best possible mother for a pheasant brood. The greatest care should be taken to see that the hen selected for incubation purposes is free from roup or any other disease, as the young pheasants are more tender and susceptible to contagion than are domestic chicks.

The coop or house in which the nest is located should be "mice tight" as the pheasant chicks will, almost the instant they are hatched, attempt to escape. Later, after they are accustomed to their domesticated foster mother and to their surroundings, they will become very tame. For the first twenty-four hours after hatching they should be fed nothing. With English pheasant eggs the period of incubation is about twenty-three days, but the hen should not be taken from the nest until the twenty-fourth day.

No detail in pheasant raising is more important than the proper preparation of the nest in which the eggs are to be hatched. The nest must rest on the ground and be made of earth. It should be permitted to dry and be bedded with a thin layer of fine straw or hay.

All of the hatching coops on the Wallace Evans game farm—and there are more than a thousand of them—are two feet square, made of common inch lumber with a slant roof hung with strap hinges.

These coops are two feet high on one side and eighteen inches on the other. In the higher side of the coop a small hole is cut and fitted with a sliding door. When the morning of the day for hatching arrives this door is closed—and remains closed until the chicks are at least a day old. Then they are allowed to go out into the little runway made of small-meshed chicken wire, a day or two before being put upon the open range.

Above all, strict care must be taken that the young pheasant chicks are neither hatched nor permitted to range upon ground used before as a chicken or pheasant runway. No variation from this rule should be entertained, as the young pheasants are almost sure to sicken and die on ground that has been contaminated. This is one reason why Mr. Evans requires five hundred acres for his ten or twelve thousand birds. Not only does he change the location of his big yards each year, but his breeding pens and those containing the young birds are moved every few days. These are built just small enough so that they can be fitted with low wheels and hauled from one spot to another, by team. Young chicks are especially prone to ailments caused by contaminated ground and their coops should be shifted almost daily.

When the chicks are twenty-four hours old they are started on a diet of egg custard—domestic hens' eggs and milk cooked together until they are more "stiff" than the ordinary table custard. This diet is continued for four days, after which they are changed to hard boiled eggs finely grated, then to special pheasant food prepared for the purpose and sold by leading poultry supply houses.

At the age of four days the chicks have conquered their wild instincts to the extent of adopting the hen as their mother and guardian. Then they may be liberated and allowed to have open range—but never when there is dew or moisture of any kind on the grass. One has only to watch the movements of a brood of young pheasants in the grass to realize that they are the most eager and industrious insect exterminators ever hatched. This insect life is necessary to their existence. If, for any reason, it is impossible to give them open range, this demand for meat food should be met by feeding the special pheasant foods above referred to. But whether kept in confinement in a runway or allowed to range in weeds and grass, they should be given a light ration of chick food composed of finely cracked grains. The food of grown pheasants is a mixed or balanced ration of cracked grains, grits, beef scraps, and a small proportion of granulated bone.

As soon as the young pheasants begin to fly it is well to clip one wing of each bird. The amateur breeder will do well to watch closely the habits of the young birds and especially to note their first signs of independence of the mother hen. Then they should be carefully confined to runways and their days of liberty brought to a sudden close. Old birds may be safely confined within an eight-foot woven wire fence provided care is exercised to keep a wing of each bird clipped short—otherwise the runway must be covered. In handling the birds a "minnow net" attached to a stout pole is of constant service. With this the wildest birds may be easily caught without damage.

There is an undeniable charm and fascination in raising these beautiful birds that is, in itself, something of a compensation for the care and the patience involved. It is a task in which young boys and girls are easily interested and which is well calculated to impress upon them, in a practical way, many useful and important lessons—of which the necessity for scrupulous and sanitary cleanliness is not the least. Few birds in the world are more magnificently beautiful than are the "show" varieties of pheasants. These should be raised only by those who are keenly alive to the beauty of the birds and they are most successfully produced in small flocks. In fact the Goldens, Silvers, Reeves, Amhersts and Elliots are admirably adapted to the conditions of the man or woman living in a small country village who has no more ground than an ordinary village lot provides.

WORLD'S SMALLEST FLEET—MODELS OF VESSELS REPRESENTING THE PRINCIPAL SHIPPING COMPANIES USING THE PORT OF LONDON.

HOGS GRIND THEIR OWN CORN

THE hog raisers at the agricultural station out in South Dakota make the animals grind their own grain before they are permitted to eat it—not because the experts are too lazy, but because the exercise has been found to be good for the hogs. This grinding is done in a "hog motor" which has a stationary burr in the center, with additional burrs attached to the inner edge of a drum. The grain is poured into this drum and the hogs, seeing the meal in the small openings at the bottom, attempt to root it out with their snouts. They push and push around after it, all the time causing the drum to revolve and the grain to grind into meal which drops down for the hogs to eat. All of this is not only excellent for the hog's digestion, but puts him also in prime shape for the butcher.

Stock raisers explain that animals while fattening require exercise. The advantage of having hogs do their own grinding may be appreciated when it is learned that experiments made by hog raisers and experts in Maine, Ohio, West Virginia, Kentucky, Missouri and Wisconsin have found that it is more economical to feed whole grain to hogs, because the additional expense incurred in grinding does not pay for the small increased gain in flesh. But if that gain can be obtained without additional expense, then the meal should be fed.

HOGS GRINDING THEIR OWN CORN—IT IS GOOD FOR THEM.

WORLD'S SMALLEST FLEET

THIS fleet of ships, probably the smallest ever made, represent some of the vessels of the principal shipping companies using the port of London. The purpose in turning out these little ships is to show that new docks which are to be built will be capable of taking in and floating any of the vessels represented by the miniatures. The fleet was made to the order of the port of London authorities, to be placed in the model of the docks for exhibition to the King, on his visit to the docks. The hulls of the little craft are of wood, the masts of steel, each ship has its full equipment of boats and davits, ventilators, stanchions, winches, derricks, skylights, etc. It is also painted in the exact colors of the big ship itself, with name on the bows. The line of small vessels shown to the front of the photograph consists of Thames barges of various tonnage, the sizes of these models varying from seven-eighths of an inch to one inch in length.

HIGH SCHOOL IN A BATH HOUSE

THE old bath house at Venice, California, has been entirely reconstructed inside so as to form a high school building, accommodating about one hundred pupils. The great concrete plunge has been covered with planks and a substantial floor conceals the fact that a swimming tank ever occupied the space. The dressing rooms have been torn out, with the exception of a few retained for lockers, and in their place are about a dozen class rooms, besides laboratories, workshops for manual training, and a large assembly hall, where a moving picture machine is used in connection with the science course. The little city is built upon the banks of artificial waterways, and as the photograph indicates, the high school occupies a beautiful site upon the main canal. The building was abandoned as a bath house several years ago when a new one was erected, but it has just recently been built over for school purposes.

CURIOUS CHINESE VESSEL

FROM Wusung, China, a seaport town a little north of Shanghai, to San Francisco is about sixty-five hundred miles. At the present time a curious

THE EUROPEAN-MANNED CHINESE VESSEL *Ningpo.*

Chinese vessel, the *Ningpo,* is somewhere between these points, San Francisco bound. The *Ningpo,* though Chinese in build and appearance, is manned by a European crew of twenty men and four officers. Some notion of the slow progress that a vessel of this sort makes may be gathered from the statement that it is expected that three, or even four months, will be required to complete the voyage. This means that the ship is expected to average but fifty-five to sixty-five miles a day.

This is the second attempt that has been made to cross the Pacific Ocean in the *Ningpo.* Disaster at sea was encoun-

THE BATH HOUSE THAT WAS CONVERTED INTO A HIGH SCHOOL.

WHERE COPPER INGOTS ARE CAST BY MACHINE.

tered shortly after the vessel put out and two members of the crew were drowned. One very curious thing in reference to this craft is that it has eight reserve rudders on board, for use in case of accident.

It will be one of the exhibits at the Panama-Pacific Exposition in 1915.

CASTING COPPER INGOTS BY MACHINE

A LARGE, spider-like machine, which receives molten copper from a furnace, and turns out ingots at the amazing rate of 100,000 pounds an hour, is entirely revolutionizing and concentrating the copper smelting industry of this country.

The relative efficiency of the automatic ingot casting machine and the archaic, hand-pouring method is plainly shown by actual figures:

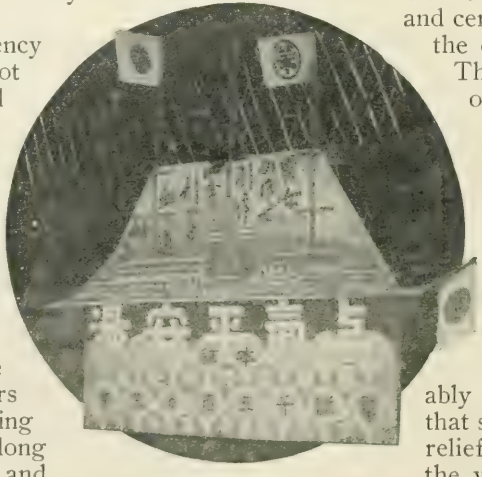
By hand, 5 men, 6 hours, 25,000 pounds; machine, 1 man 1 hour, 100,000 pounds.

From the furnace the liquid copper pours —a brilliant, scintillating stream — into an oblong iron receptacle, and thence, by a number of vents in the side, it flows into ingot molds arranged on the circumference of a large wheel—much- resembling an enormous spider in appearance—slowly revolved by an electric motor.

When the molds have made a half revolution of the large wheel—starting at the iron receptacle—they are emptied suddenly and the red-hot ingots plunged into cold water.

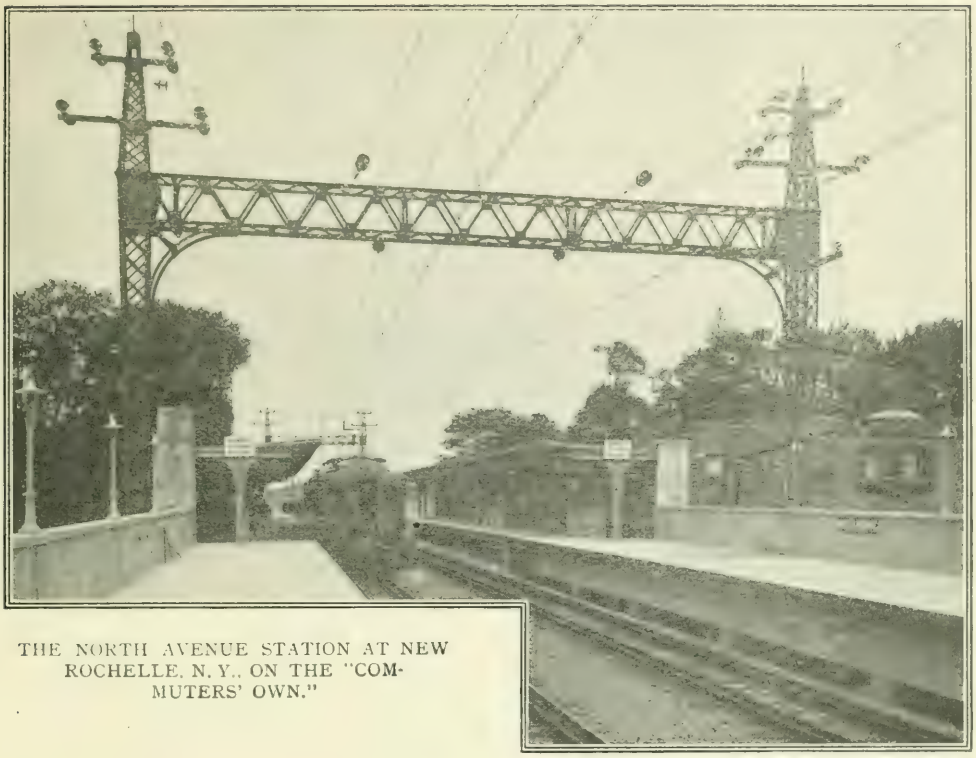
HOW THE JAPS ADVERTISE

THE Japanese have scored a triumph over all other nations in the advertising field. The "ad" shown in the illustration is effective and artistic, and at the same time it is striking, original, and certain to seize and hold the eye of the passer-by. The figure represents in outline a big ocean liner, sailing serenely over curiously depicted waves.



ADVERTISEMENT OF A STEAMSHIP COMPANY IN YOKOHAMA.

At the same time no opportunity has been lost by this cunning "ad" man to incorporate plenty of reading matter. Presumably the five characters that stand out in such bold relief against the hull of the vessel spell the name of the shipping concern.



THE NORTH AVENUE STATION AT NEW ROCHELLE, N. Y., ON THE "COMMUTERS' OWN."

RAILROAD GETS RID OF PASSENGERS

By

CHARLES FREDERICK CARTER

"HERE is a thirty-million-dollar railroad for your very own. Take it, with my blessing. Now, run along with you and commute to your heart's content, and don't bother your Uncle Charley any more."

Is it possible for the most exuberant fancy to imagine a railroad president talking like that to his commuters?

Fancy, or no fancy, the records of the Public Service Commission, second district, of New York, show that Charles S. Mellen, President of the New York, New Haven and Hartford Railroad did say substantially that to the commuters of New York. If the official records are not regarded as competent evidence, the Commuters' Own, alias the New York, Westchester and Boston Railroad, itself is submitted. It would be hard to get away from the Commuters' Own, which was opened for traffic May 29, 1912, for it is, decidedly, the most substantial thing in railroads the world has yet been privileged to see.

Never before has a railroad found it worth while to spend thirty million dollars to get rid of a portion of its passenger traffic. What makes the matter more extraordinary is that the New Haven road, which has already spent the thirty

TEN-CAR-TRAIN ON THE "COMMUTERS' OWN," A LINE BUILT TO GET RID OF A PORTION OF A RAILROAD COMPANY'S PASSENGER TRAFFIC.

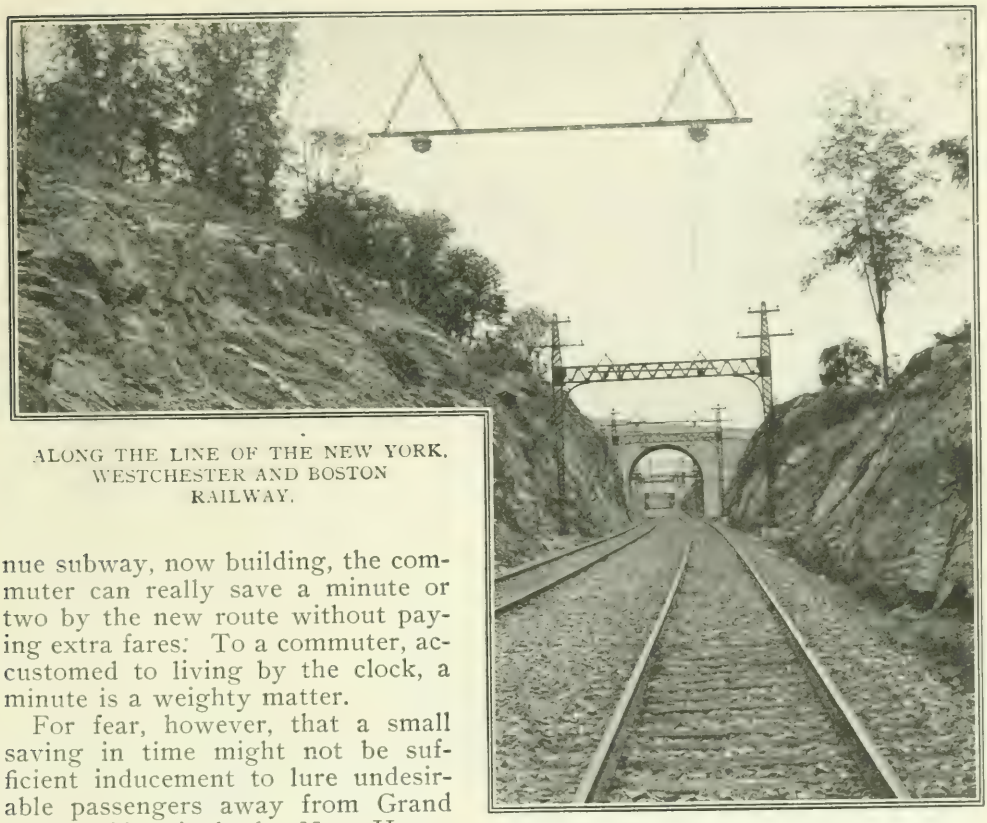
millions and is preparing to spend more, is the only railroad in the United States that derives more revenue from passenger than from freight traffic and, therefore, might be supposed to appreciate passengers.

The explanation of this anomalous situation is to be found in a contract entered into in 1848, before President Mellen was born. That contract fixed the rental which the New Haven was to pay the Harlem Railroad, now a part of the New York Central, for the use of terminal facilities in New York City. At present the rental figures out at the rate of eighteen cents a head for all New Haven passengers brought to New York. As the round trip commutation rate from Mt. Vernon, one of the commuters' strongholds, is sixteen cents, President Mellen did not have to wear out many pencils to ascertain that his road was out of pocket the price of a postage stamp every time a Mt. Vernon commuter came to New York. When he found, further, that under the increased charges after the new Grand Central Terminal was opened the New Haven would be out twenty-four cents on every trip of a Mt. Vernon commuter, he nearly had heart failure.

The New Haven raised its commutation rates, whereupon the commuters raised Cain. Things came to such a pass that President Mellen had to spend most of his time at hearings and such like explaining that attempted raise. Several process servers amassed competences from their fees for summoning him to court in that increased rate affair.

One day President Mellen chanced to hear of the New York, Westchester and Boston, a paper railroad incorporated in 1872, the charter for which had long been on the bargain counter. The New Haven bought the charter and proceeded under the rights it conferred to build a four-track railroad parallel to its existing lines through New York commuting territory. By competing with itself the New Haven hoped to get rid of its undesirable commuters. As the New York, Westchester and Boston stopped across the Harlem River from Manhattan Island, five miles from Grand Central Station, its passengers would not cost the New Haven anything for terminal charges.

To be sure, commuters on the new route would have to finish their journey on street cars; but they had to do that any way, even when they went through to Grand Central Station. As the Commuters' Own makes direct connection with the East Side elevated lines and will make direct connection both with the existing subway and the Lexington Ave-



ALONG THE LINE OF THE NEW YORK, WESTCHESTER AND BOSTON RAILWAY.

nue subway, now building, the commuter can really save a minute or two by the new route without paying extra fares. To a commuter, accustomed to living by the clock, a minute is a weighty matter.

For fear, however, that a small saving in time might not be sufficient inducement to lure undesirable passengers away from Grand Central Terminal, the New Haven determined to go the limit in building the Commuters' Own, hoping thus to make the new route irresistible. The lid was taken off the treasury and the engineers were invited to help themselves. The result is the finest specimen of the art of railroad building extant. In every detail the Commuters' Own measures up to the highest standard known to date.

The New York, Westchester and Boston is the first standard railroad ever built solely for commutation traffic. Notwithstanding its grandiose title, it connects New York with no other important point, nor is there any likelihood that it ever will. While it is to be extended some miles, it is not to reach beyond the limits of the commutation zone. No freight is to be carried. The company does not own a freight car, nor have any facilities been provided at stations for handling freight. Even baggage is frowned upon—that is, any baggage beyond the customary bundles which are the trade mark of the commuter. Only two cars have small baggage compartments. To get a trunk into these the passenger must purchase a baggage ticket.

J. Pierpont Morgan is a director of the Commuters' Own, and he is popularly supposed to be a fairly shrewd sort of person in money matters. Yet the road was built with the knowledge that it could not earn fixed charges for some years. But as it runs through undeveloped territory for the most part, it may do better in time.

Another distinction of the Commuters' Own is that it is the only standard electric railroad in America, built as such. The others, most of which are to be found in New York City, are merely converted steam roads. As for interurban roads, if they be not considered as extensions of street car lines, they are at least of light and cheap construction. The Commuters' Own is of the most massive construction for the heaviest possible traffic.

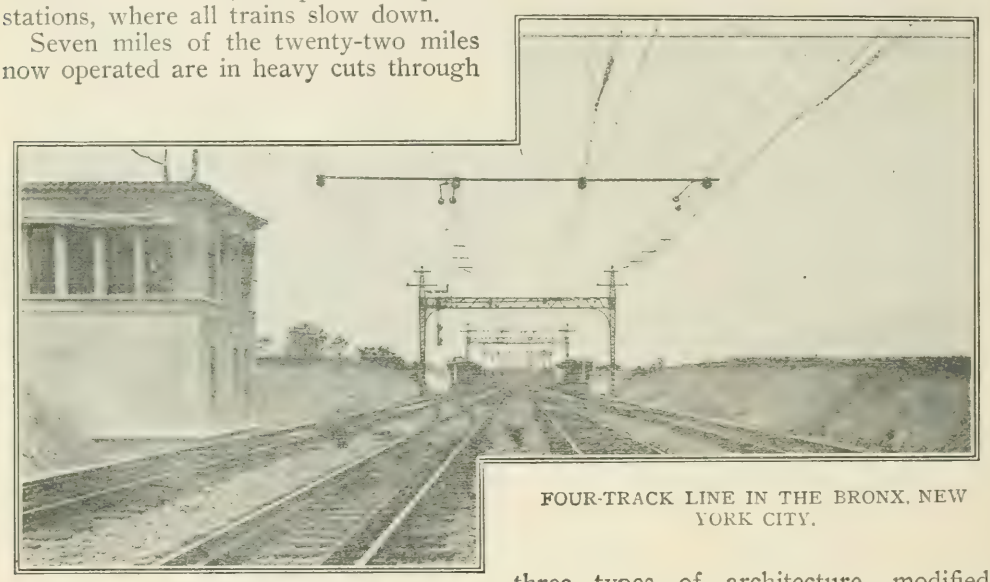
There are four tracks, two for local

and two for express trains to Mt. Vernon, ten miles from the southern terminus. Here the road divides into two two-track lines, one going to New Rochelle, the other to White Plains. Being built through rolling country scarcely any part of the line is on the natural surface of the ground. The grades, with two exceptions, are less than one per cent, and these were so peculiarly situated that the grade could not be reduced. Curves do not exceed four degrees, which is not so much of a curve, except near express stations, where all trains slow down.

Seven miles of the twenty-two miles now operated are in heavy cuts through solid rock, for the most part the average depth being sixteen feet. Of the remainder, nine miles are on fills averaging fourteen feet high, while two and a half miles are on massive steel viaducts and bridges, and four-fifths of a mile is a four-track tunnel. The ninety-pound steel rails are laid on creosoted pine ties that cost $1.14 each, which, in turn, repose on fourteen inches of rock ballast. On this superb speedway express trains are expected to attain a speed of fifty-seven miles an hour, and local trains thirty-five miles.

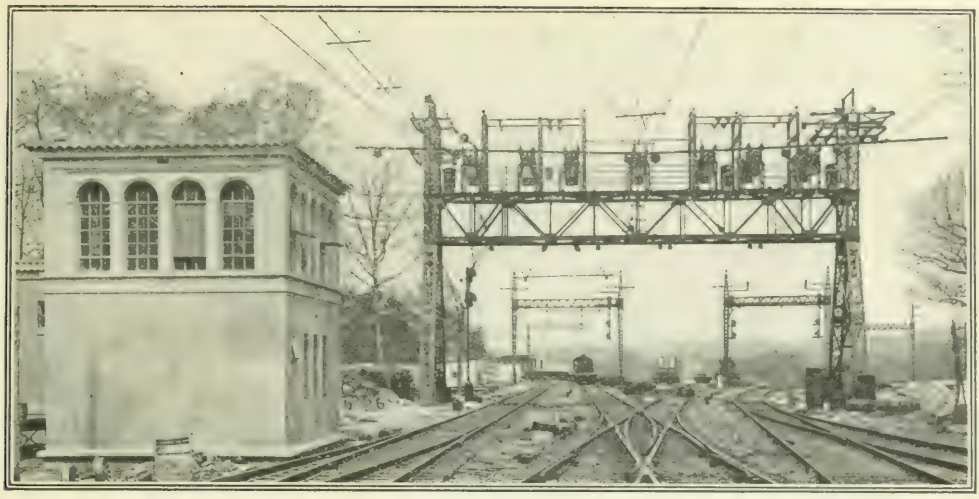
There is not a grade crossing on the line, the tracks passing over or under other railroads and highways. To do this requires one tunnel, three viaducts, and twenty-three highway bridges. All are of massive steel construction on concrete foundations with solid concrete floors. There is no temporary work of any character on the entire line, everything being built to meet ultimate requirements. As some highways are not yet opened up, this policy leaves some fine steel bridges perched in mid-air without approaches, although they are accessible to foot passengers by means of stairs.

For the first time in American history a railroad company has set out with malice aforethought to make all its stations combine modest beauty with utility. To avoid monotony the stations are of three types of architecture, modified mission, simplified Italian renaissance and classic. Everything is of steel or concrete. Inside walls are finished in terrazzo, the roofs are red tile, the station platforms, which are level with the car floor, are heavy concrete slabs, the canopies over them are of concrete with tile roofs, supported on Doric columns of concrete. All passages and stairs are eight feet wide so that belated commuters—there is no other kind—may charge in columns of fours upon trains that are about to pull out. The grounds around the stations are to be adorned with hedges, shrubbery and flowers, as soon as Nature will permit.



FOUR-TRACK LINE IN THE BRONX, NEW YORK CITY.

Cars are the last word in steel construction. Machines have at last been perfected which press out huge sections of steel that can be fitted together to form a stiff and staunch car with the least possible riveting. These units not only make



THE WHITE PLAINS BRANCH.
The latest devices in high speed electric railway construction are used.

a car at once the strongest and the lightest yet designed, but they render repairs easy and inexpensive. They are full sized, standard railroad, vestibuled coaches 72 feet long, with a seating capacity of 78, with doors in the center as well as at both ends to facilitate quick loading and unloading. The floors are a warm terra cotta shade, the walls dark green, the ceilings white. Over each seat is an electric light so that the commuter can read as comfortably, as the 120,000 pound car glides smoothly over the superb roadway, as he could in his own parlor, if a commuter can be imagined as having any time to spend in his own parlor.

The power to drive each car is provided by two motors of 175 horsepower each, capable of increasing speed one mile an hour for each second, for the commuter demands quick action. To this end express stops have been figured out at twenty-five seconds each; local stops fifteen seconds. Should the motorman grow reckless, an overspeed relay automatically cuts off the power whenever the speed exceeds fifty-seven miles an hour. A "Dead Man's Handle" automatically shuts off power and applies the brakes should accident or sudden illness cause the motorman to release his hold on the controller.

Quick stops being quite as important as rapid increases of speed, two brake shoes are applied to each wheel of motor trucks to give the maximum braking power with a minimum pressure and consequent heating. The brakes are controlled by electricity, which is a shade quicker than air, though the old reliable air control is reserved for emergencies.

Automatic block signals and interlocking machines of the latest type safeguard train movements.

The happy conductor on the Commuters' Own has nothing to do but to ride over the road and draw his salary. He never bothers his head about the trolley pole, for there isn't any. Current is collected from an overhead wire by a pantograph, a long bar held against, and at right angles to, the wire by two pairs of jointed arms at each side. At a touch on a lever in the motorman's cab compressed air cylinders raise the pantograph or fold it down flat on the roof.

Tickets bother the conductor no more than the trolley pole, for the passenger never shows his ticket on the train, but gives it up, on leaving the station at the end of his journey, in European style. The line is divided into eight zones at a nickel a zone. Each zone has tickets of a certain color so that the ticket chopper can tell by the color alone when a passenger tries to take a longer ride than he has paid for. The commuter's monthly ticket is punched by the agent before he boards the train.

PAINTING IT WHITE

IF you happen to land in Salt Lake City, Utah, on a day when the sulphurous smoke from the smelters about the city does not obscure the sun, you will catch a glimpse of a huge white letter "U" away up on the side of the Wasatch mountain back of the city.

At a distance it seems like a small affair but at closer view it becomes a mighty character lying on the smooth breast of the mountain. Every year the students from the Utah University make a special pilgrimage to the letter and give it its annual whitewashing.

How It Looks From a Distance.

The letter is of concrete seventy feet wide by ninety long, and in that arid region the rainfall is so small that it keeps fairly white for a long time. When it does begin to show signs of fading, the students take a holiday and, carrying great supplies of whitewashing material, climb up the mountainside and proceed to decorate the letter anew.

While the boys are doing this, the girls are as busy as bees with a campfire, over which coffee is boiled, which, with sandwiches and cake, makes a jolly feast when the work is finished.

The mountain on which the letter is located is a treeless one with a covering of sage brush and grass common to many of the mountains of Utah. Thus the letter shows up brilliantly against the dark background, making it a landmark for many miles around the city.

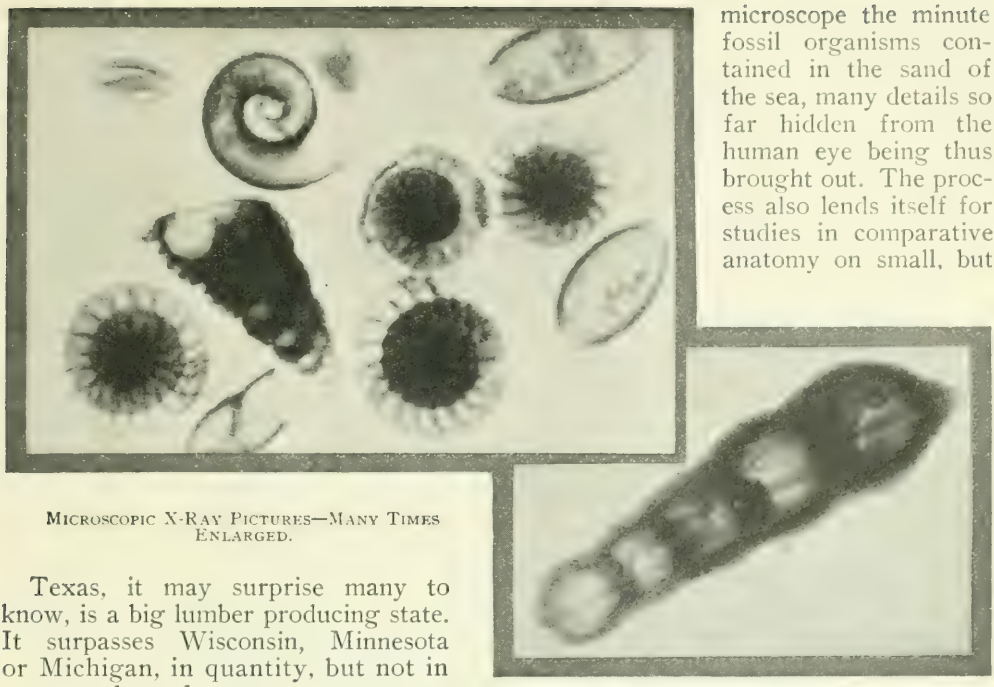
TEXAS' BIG PINE TREE

IN Texas a single pine tree recently established a record that is not equaled every day. Though the State is not noted for its big trees as are such States as California and Washington, nevertheless eastern Texas is known as a lumber region and some of the trees grow to great size.

The tree shown in the accompanying picture produced six thousand feet of lumber and then enough was left of the branches to make four hundred cords of stove wood. The tree was grown near Longview and stood more than a hundred feet high. The main trunk was sixty-five feet in length. When the trunk was cut down four teams were required to haul it to the mill. Each team hauled a single length sixteen feet long and weighing three tons.

The big logs attracted a great deal of attention.

HOW IT IS DONE.



MICROSCOPIC X-RAY PICTURES—MANY TIMES ENLARGED.

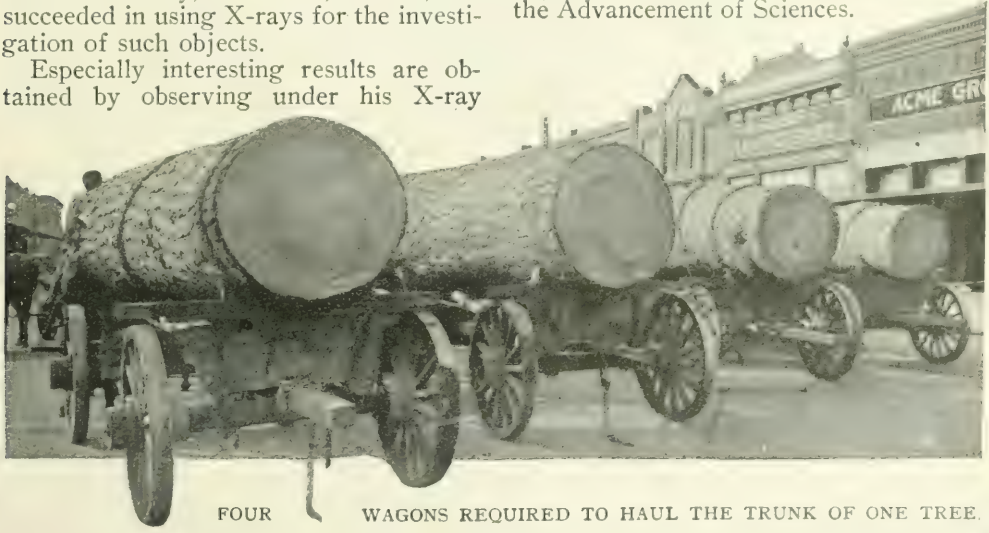
Texas, it may surprise many to know, is a big lumber producing state. It surpasses Wisconsin, Minnesota or Michigan, in quantity, but not in money value, of output.

MICROSCOPIC X-RAY PICTURES

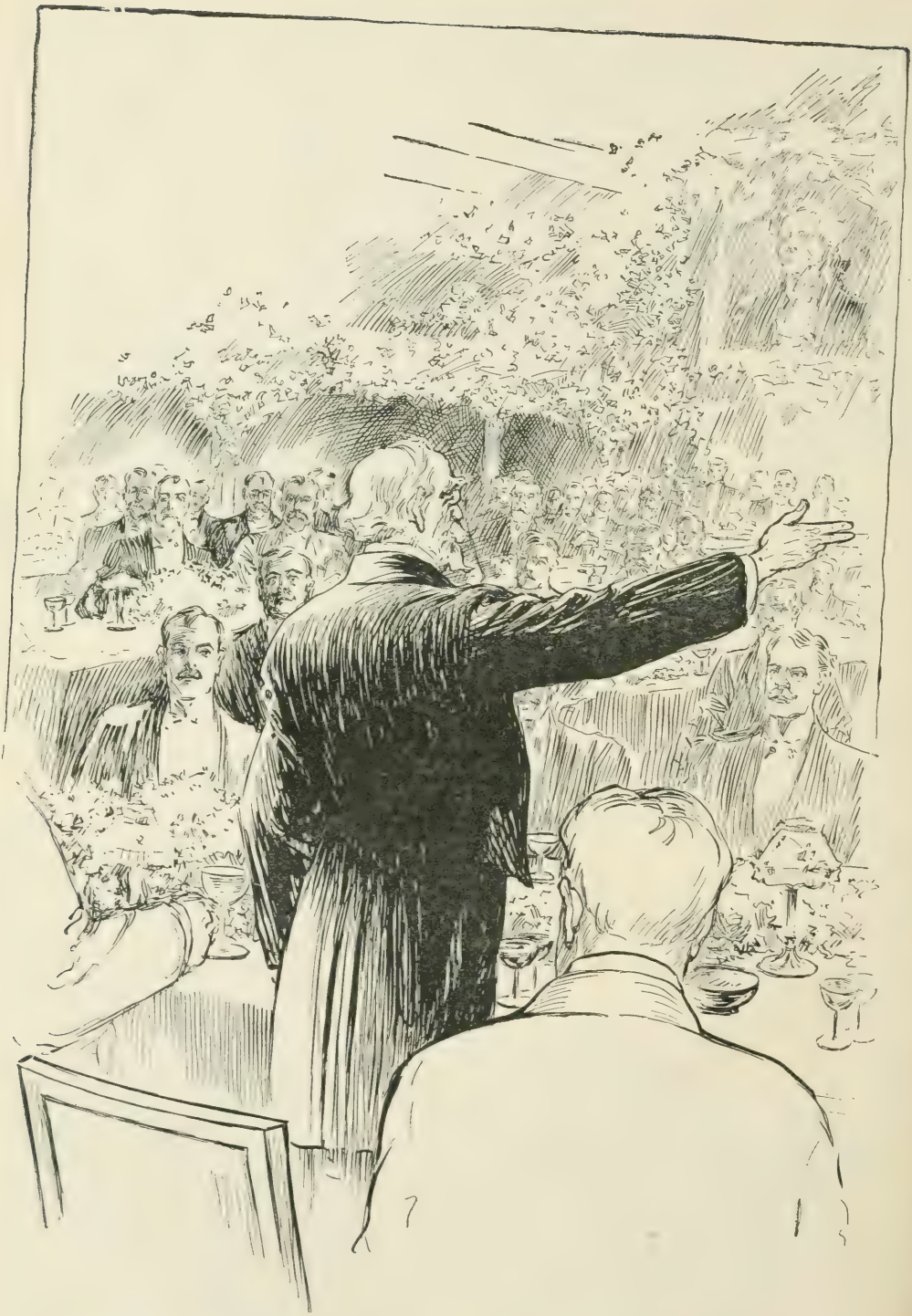
OPAQUE objects, to be observed under the microscope, have so far been used in the form of thin slices—sections. This procedure, however, is not practicable in all cases, and even when feasible, it is a most troublesome process. M. Pierre Goby, of Grasse, France, has succeeded in using X-rays for the investigation of such objects.

Especially interesting results are obtained by observing under his X-ray microscope the minute fossil organisms contained in the sand of the sea, many details so far hidden from the human eye being thus brought out. The process also lends itself for studies in comparative anatomy on small, but not microscopically small, animals. It is especially interesting to watch the development of bones from the birth of the individual until its adult stage. Other applications of the new process will doubtless be suggested in the near future.

An announcement of the process and of what Goby thinks to be the advent of a new science, was made at the recent Congress of the French Association for the Advancement of Sciences.



FOUR WAGONS REQUIRED TO HAUL THE TRUNK OF ONE TREE.



"JUDGE CHARTERS, WITH THE TEARS RUNNING DOWN HIS FACE, MADE THE CLOSING SPEECH."

THE GREAT GIBSON MEMORIAL ROAD

By

HENRY M. HYDE

THE long stretch of the Wake Forest road was abloom with masses of white dogwood and ablaze with the rosy glow of pink bud. It reminded me of a church aisle, trimmed for a wedding procession. Turning the sharp corner at the bottom of Stepney Hill I came upon old Major Carter, in riding gaiters and shirt sleeves, watching the operation of two disc harrows—each pulled by three big mules—that were pulverizing the red soil of one of his big corn fields.

"Good morning, Major," I greeted him. "I wish that some of the people who call us old-fashioned and slow could see our modern farm machinery."

The old man smiled, a slow and quizzical smile. "Well, suh," he answered, "I reckon we are a mighty conservative lot of folks. It takes right smart of a talker to persuade us to go into a new thing. But once we do hook onto a new hitch there's nobody will pull harder or travel further than we all. Just for instance; did you ever hear, suh, how the farmers out here in the Third Election District put through the great Gibson Memorial Road?"

There was a sly twinkle in the old man's blue eyes. He pointed out over the beautiful rolling country to where on the top of a distant mountain a spot of white shone among the green. "You know the old Gibson place, Bella Vista, up there on the top of Big Blue Mountain, of course, suh?" I nodded. I knew not only the famous old manor house, but I knew also the road winding around Big Blue Mountain, which all the farmers in the district had to travel on their way to and from the market town. I knew every foot of the way from the clay bottom where Cow and Calf Run broke across the road to the steep pitch on the mountain side, where ragged shoulders of rock pushed their way to the surface, making a steep and slippery descent which the natives called the Devil's Feather Bed. I jumped down from my horse, threw the bridle over one of the stakes of the worm fence, and asked for the story.

"The first any of us heard of it was when a notice appeared in the Weekly Palladium, inviting all the residents of the district to attend a meeting at the Court House at 1 o'clock on the afternoon of next Court Day. It was signed 'Committee,' without any names, and it went on to say that 'a plan will be presented at the meeting which will put money into the pocket of every farmer in the district.'

"Court Day was nearly three weeks off and the neighbors and I had a lot of fun talking over the call for the meeting. It was a little too generous to sound good to us. Major Beverly Peyton said he was going to send in a four-mule team to bring home his share of the plunder and old Dr. Harbison, riding by on his black pacing mare Court Day morning, warned us, with a wave of his hand, to 'beware of nameless Greeks bearing gifts.' The doctor still sticks to his classics.

"It was a big Court Day, with a powerful lot of stock in town and a busy time buying and selling around the Square. Long about noon I met Mr. Jim Peachey, who owns the next farm to mine, and asked him to walk over to the Court House with me. 'All right, suh,' Mr. Jim answered. 'I carried in a load of lambs with me this morning and if you'll just wait a minute I'll step into the bank and make a deposit, so's to have plenty of room in my pockets for the money they're going to hand us.'

"The District Court room was full of farmers, with a sprinkling of solid business men of the county seat up in the

front benches. Old Judge Fitzhugh Charters presided. The Judge served one term in Congress back in the '70s and he's been living up to his idea of the dignity of a statesman ever since. He rapped the meeting to order and got up to make the opening speech. 'We are a proud and patriotic people,' he began, which was pretty much the way the Judge began all his speeches. He said our grand old county was full of historic landmarks; that the Third-Election District was particularly fortunate in the possession of the ancient manor house and plantation where Gibson was born and where he spent the best part of his life. 'The fame of Gibson is as wide as the world,' the Judge went on. 'He was one of the immortal forefathers of the Republic. His career is a constant inspiration to our statesmen. The stately home which he loved so dearly and which is still redolent of his memory, should be the revered object of national and international pilgrimages. Why is it not so? Because, during a large part of each year, the road leading from this city to the top of Big Blue Mountain is almost impassable. Let us build a broad and smooth highway over the five miles leading to this historic shrine. Over such a highway the procession of pilgrims would be unending. Incidentally they would bring prosperity in their wake to our beloved city and the building of such a splendid road from town to the heart of the Third-Election District would almost double the value of every acre of farming land within its limits.'

"The men in the front benches clapped their hands at this, but we farmers mostly kept quiet, smiling at each other and keeping our eyes open for the nigro in the woodpile.

"'But,' the Judge went on, 'I do not wish to lay stress on the purely mercenary aspects of this project'—the old Judge never was much of a hand in purely mercenary matters. He wound up with another burst of eloquence and introduced a young man who was one of the good-roads sharks from the government bureau at Washington.

"'Bad roads are costing every one of you farmers,' the young man began, 'an average of $287.54 a year'. He showed us pictures of country roads before and after they were fixed up. He quoted figures showing how good roads had nearly doubled the selling price of farm lands in several counties in our State. He told us just how much the clay mire and the Devil's Feather Bed added to the cost of getting a bushel of corn to market. He got us interested—he was so much in earnest. Then Mr. Tom Blackburn, President of the First National Bank, got up. The business men of the county seat, he said, were ready to meet the farmers more than half way in securing the construction of this much-needed road. The expert had estimated that the five miles could be put in good condition for $7,500. The business men of the town were ready to raise $5,000 of this amount, if the farmers would put up the balance—only $2,500. Now we all knew that Mr. Tom was powerful close in money matters and if he thought the plan was worth raising $5,000 for, it seemed it certainly should be worth half that to us. There were some more speeches and finally we all agreed to go in and try to raise the money. Judge Fitzhugh Charters was made Chairman of the permanent Committee to see the thing through. The Judge stuck his right hand inside the bosom of his black coat and said this was the proudest moment of his life. He would go to Washington at once, where, he might say in confidence, he had every hope of persuading Congress to pass a bill appropriating $10,000, at least, towards making the Gibson Memorial Road a great national monument. With the present splendid local support behind him, he failed to see how the national legislature could refuse to endorse the project.

"Inside of a month we had our share of the money raised and deposited to the credit of the Committee. Then, one Court Day, all the subscribers were invited to attend a dinner at the county seat. The Judge reported that his bill was already introduced in the House and referred to a committee which had promised to report it favorably. He had also succeeded in securing a promise from a large number of Cabinet members, Senators, and Congressmen, to attend the laying of the corner stone of the memorial road. He announced with pride that the dedication of the corner stone was

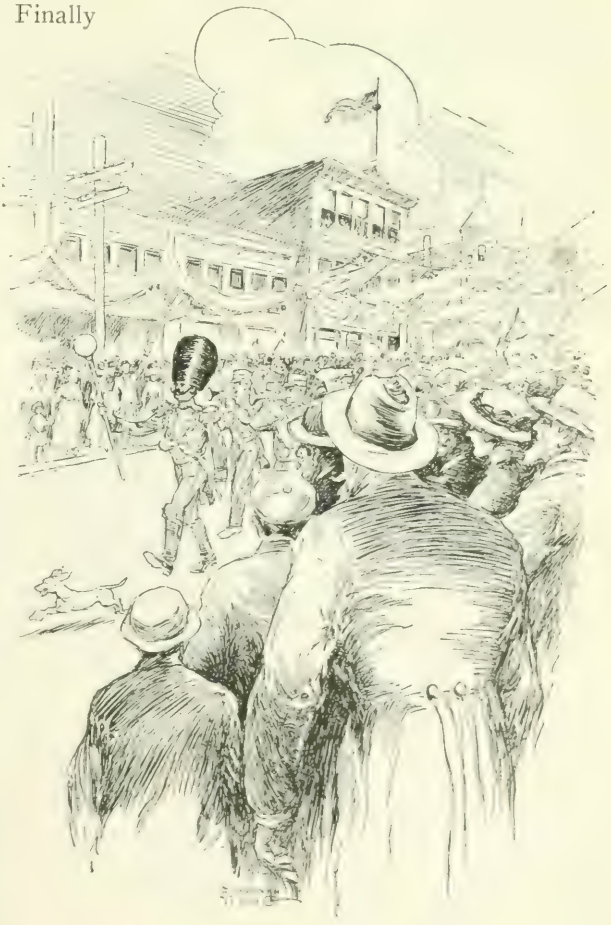
certain to be one of the most memorable and distinguished ceremonies in the history of the commonwealth.

"Mr. Tom Blackburn, the bank President, said that some of the town subscribers to the road fund were a little slow in paying over the money, but that about half of the $5,000 was already on hand and he would keep after the delinquents. He congratulated the farmers, who were "the bone and sinew of every community," on the promptness with which they had met their obligations.

"From time to time Judge Charters sent printed reports of progress around to the subscribers. His bill appropriating $10,000 for the Gibson Memorial would be favorably reported; it had been introduced in the Senate; he had worked up much enthusiasm for the project. It was certain that the laying of the corner stone would attract national attention. Finally we all got handsome engraved invitations to the dedication and to a grand banquet the following evening, at which the memory and fame of Gibson would be fittingly celebrated. Three or four United States senators, two cabinet officers and a couple of foreign ambassadors were down for speeches. A special train was coming to bring about a third of official Washington and the guests of honor from other parts of the country. At the banquet all the products of the county, including our native wines were to be served. The corner stone, itself, had been designed by a famous sculptor and was now being carved from a block of Parian marble. Mr. Tom Blackburn was to preside at the ceremony of laying the corner stone and Judge Charters to serve as toastmaster at the banquet.

"Well, suh, it certainly was a great show. Main street was decorated with flags and pictures of Gibson. Two brass bands were parading up and down. The Governor's Grays, our crack militia company, was drawn up at the station when the special train pulled in and all the carriages and hacks in town were waiting to carry the visitors. Mr. Tom Blackburn was riding a big sorrel horse and having lots of trouble doing it. There were six cars on the special, including one on the end, where our native wines were being served free of charge to all the guests.

"First of all, the procession marched to the skating rink, where a caterer from Washington served an 11 o'clock breakfast to the party, while most of the farmers in the county, who had come in to see the show, waited for things to get under way. About 1 o'clock we all went out to the city limits, where the road to Big Blue Mountain branches off from Main street. There a big speaker's platform had been built, with benches for three or four thousand people in front



"It Certainly Was a Great Show."

of it. The bands played, a quartette of singers from Washington warbled some, and Mr. Tom Blackburn introduced the various great men who were to make the speeches. Some of them were fine speakers and they got even us farmers cheering with their eloquence. Judge Charters dug the first shovelful of dirt for the hole in which the corner-stone was planted. It was a nice square block of white marble with a few words from one of Gibson's speeches engraved on it. When it was over everybody piled into the hacks and carriages and drove out over the Blue Mountain road to Bella Vista. Dinner was waiting at the skating rink when we got back and, once more, our native wines were on tap.

"The next evening came the grand banquet. The skating rink looked mighty pretty. It was trimmed up with dogwood and red-bud trees, all in full bloom and there was a huge painting of Gibson that hung at the far end of the building. The place was filled with tables and there were seats for nearly a thousand people, including, of course, all us fellows from out here in the district. There were so many important men there, including the ambassadors from half the countries of Europe, that we were all glad to see that the thing was being done up in style. And it certainly was. The caterer from Washington had done his best, the colored waiters were all in dress suits, two bands were playing whenever somebody wasn't delivering an oration and, all the time, corks were popping out of bottles of our native wines. It was 3 o'clock in the morning before the last of us got away from the tables, after Judge Charters, with tears running down his cheeks, had made the closing speech.

"Judge Charters Dug the First Shovelful of Dirt."

"About a week later each one of us got a paper from Washington with two or three columns telling all about the great ceremonies connected with the dedication. After that we didn't hear from the Judge again for more than a month. Finally one day I saw in the Palladium that Congress had adjourned, and the next time I went to town I called at the bank and asked Mr. Blackburn when the work of building the road was going to begin. He promised to consult with Judge Charters at once and make a report. And he did. Each one of us got a little printed statement in about ten days.

Congress had adjourned without passing the bill appropriating $10,000 for the Gibson Memorial. The Judge said that this failure was due to the unfortunate fact that partisan politics had raised its slimy head in the councils of patriotism. As soon as the selfish and petty struggle for party and personal aggrandizement ceased and the clear-eyed goddess of reason resumed her serene

sway, he felt certain that a wise and far-sighted Congress would see the necessity for making the home of Randolph Gibson a national shrine and memorial. In the meantime he congratulated the subscribers to the fund on the tremendous success of the ceremony of laying the corner stone and begged to submit a statement of expenses up to the time of writing."

Major Carter pulled a long black bill-book from his hip-pocket and unfolded a creased slip of paper. "There it is, suh. I like to show this statement to people who talk about our conservatism."

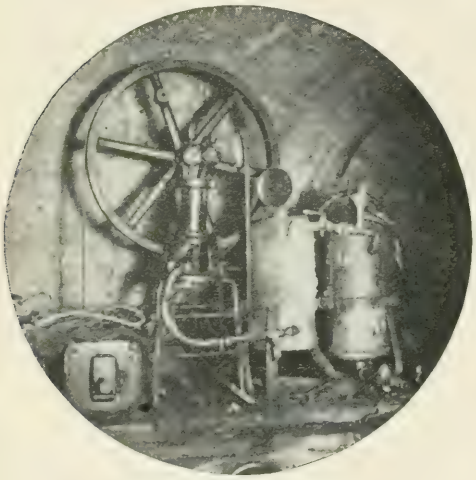
Cash collected.....		$5,245.00
Cash due $4,755.00		
Judge Charters (Expenses)	$ 246.00	
Dinner to contributors....	367.00	
Special train from Washington and return.....	500.00	
Bands, music, engraved invitations, etc.	250.00	
Hotel bill (2 days 250 people)	750.00	
Carving corner stone, mason work, etc.....	200.00	
Banquet, native wines, etc. (500 plates at $3).....	1,500.00	
	$3,813.00	$3,813.00
Cash on hand.....		$1,432.00

As I looked up smiling the old Major met me with a protesting wave of the hand. "Of course, it is funny now, suh. But at the time it was most powerful aggravating. We farmers appointed a committee to go in and interview Mr. Tom Blackburn at the bank. He allowed that there was mighty little chance of collecting any of the outstanding subscriptions. Most of it had been put down by people in town who simply didn't have the money and couldn't raise it. Meanwhile the old Judge was up at Washington spending what little was left. We called a special meeting of the committee and got them to turn over the balance to be spent in dragging the road and blasting out the rocks in what looked like the worst places. We managed to get it into fairly good shape that summer and it's never been quite so bad since.

"If you are riding into town this morning, suh, and will look mighty carefully just where the Big Blue Mountain road joins the end of Main street I think you'll still be able to see the top of the corner stone. Except in very bad weather it usually sticks out several inches above the mud!"

NEW WAY TO CLOSE LEAKS IN CEMENT

BEING sixty feet below street level does not entirely protect the walls of the freight subway, in Chicago's business district, from the sudden changes in temperature that occur in the streets above. The summer temperature is about 60 degrees Fahrenheit and during the winter weather the mercury registers as low as 20 degrees Fahrenheit. In cooling, the long sections draw apart and the walls of the shafts used for the elevators develop persistent leaks.



APPARATUS USED IN NEW METHOD OF CLOSING LEAKS IN CEMENT WORK.

When the bore was completed it was found that it required the work of six men, to carry the heavy tank and compressor used to force the grouting through the walls. It also required at least an hour to set the machine up and connect it ready for work. It was too large to be used on the elevators and once set up it blocked all traffic. To overcome this difficulty, the cement expert in charge of this work designed and built the smaller machine shown in the photograph, using one of the regular tunnel flat cars four feet wide and ten feet long. This outfit is ready for service in a minute's time and is pulled from one point to another by one of the regular motor cars. The concrete grouting, made of one part Portland cement and one part water, is poured into the 5½ gallon tank on the right. The air pump, operated by a 2½ horsepower motor, creates an air pressure of 120 pounds in the first tank and this air is turned in on the grouting. A hose connected to the bottom of the tank and running through a hole bored in the wall near the leak, forces the grouting into the path of the seeping water and the crevice is thus permanently closed.

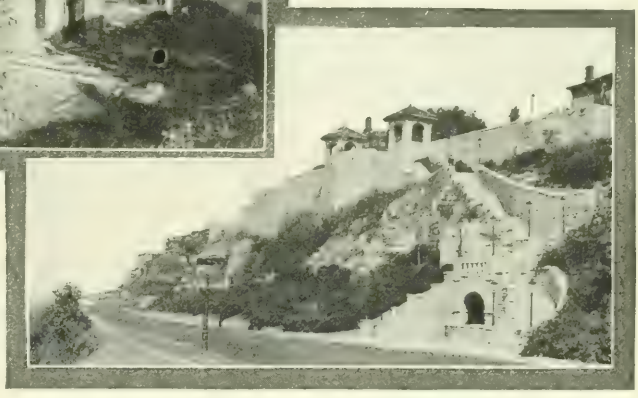
TOADS FOR HATPINS

IT required the vanity of woman and the ingenuity of man to commercialize toads. Your ordinary hop-toad, mythical source of the small boy's warts, would not answer. He must be a most individual toad. And the horned toad of Texas filled the bill as, apparently, no other hopper could be found to do.

So now milady tourist to San Antonio goes back East with her turban spiked on with a hatpin ornamented by a glistening horned toad. By a process said to be electrolytic, the destroyers of insects are coated with copper, affixed to pins and sold at a price commensurate with the desire to wear one and the ingenuity required to fill the desire.

IT REQUIRED THE VANITY OF WOMAN AND THE INGENUITY OF MAN TO COMMERCIALIZE TOADS.

But the Texas farmer will never believe that the gilded mummy, perched atop a turban in a vista of paper roses or gutta percha cherries, is helping the common cause as much as his brother in the fields, who each year destroys eleven million dollars' worth of crop enemies. It is to be hoped, therefore, that the fashion of wearing toads does not become too general.



THESE TWO PICTURES REPRESENT A TYPICAL "BEFORE-AND-AFTER" SCENE. NET VALUES IN REAL ESTATE HAVE JUMPED FORTY-FOUR PER CENT AS A RESULT OF THESE IMPROVEMENTS.

IMPROVEMENTS PAY.
Kansas City has found enormous profit in tearing down a district of old ramshackle buildings and in changing a hillside tin-can-and-goat-pasture into a picture of Old World beauty.

ENORMOUS PROFITS FROM BOULEVARDS

IT is the practice of some of the Continental cities to buy the land adjacent to a street, turn the street into a boulevard and then sell the property at a profit to put money into the city treasury. Doubtless, the plan would work as well in American cities as in the European: To take one example: Kansas City has discovered that its park and boulevard system, far from being simply a sacrifice to the gods of beauty, is in reality enormously profitable as a business transaction. It once seemed like heroics to the taxpayers to spend thousands of dollars to transform a hillside tin-can-and-goat preserve, sprinkled with a few ramshackle frame houses, into something resembling an Italian castle's terrace. But the carefully verified facts show that the very least net profit in real estate values that has resulted in the vicinity of Kansas City's many boulevards is forty-four per cent, while in other instances the land gain directly attributable to boulevards is found to run as high as 500 per cent.

WHOLESALE SLAUGHTER OF GRASSHOPPERS

O. V. WISE, of Lafayette, Colorado, devised an effective method of destroying the millions of "hoppers" that threatened his crop of alfalfa. He constructed a crude machine consisting of a dreg, a trough partly filled with unrefined kerosene oil, and a contrivance by means of which the grasshoppers were brushed into the oil as the machine was drawn across the field. With the use of nine barrels of oil, Mr. Wise gathered 200 bushels of grasshoppers. He piled them in the field to dry as shown in the illustration, and when they were dry, he fed them to his chickens. He thus managed to get rid of his pests, thereby saving his crops, and doubtless pleased his chickens.

READY FOR CHICKEN FEED.
A mound of slaughtered "hoppers."

GASOLINE-ELECTRIC TRACTOR AND MOTOR-DRIVEN HARVESTER IN USE AT ELMHURST, CALIFORNIA.

ELECTRIC HARVESTING MACHINE

A GASOLINE-ELECTRIC harvesting machine, which will harvest 2,200 bushels of grain in ten hours, at a total cost of but eighty cents an acre, has been successfully employed in the grain fields about Elmhurst, California.

The harvester, which is trailed by an eighty-horsepower gasoline tractor, is driven by a twenty-five horsepower electric motor. This machine "heads" the grain, thrashes and cleans it and delivers it in bags ready for shipment. The electric motor which drives the cutting machine, the thrashing cylinder, the conveying machinery and the recleaner is completely enclosed to protect it against flying dust and dirt. It is ventilated and cooled by a pipe which extends above the harvester out of the dust zone.

The electricity to operate the motor is generated by a thirty horsepower, direct current dynamo situated on the rear of the traction engine, between the high wheels, and is driven by a shaft extending forward and belted to the engine flywheel. The current is transmitted to the motor by means of a flexible cable.

The traction engine used in conjunction can be used for plowing and harrowing, drilling or disking, for less than half what it would cost to do the same work with horses.

REMARKABLE MONUMENT AT CASTELFIDARDO, ITALY.
It commemorates the victory (in 1860) won by General Cialdini, at the head of the Piedmont soldiers, against the Pope's forces, which resulted in the loss of Papal control of Italy in temporal affairs.
The monument is the work of Vite Pardo.

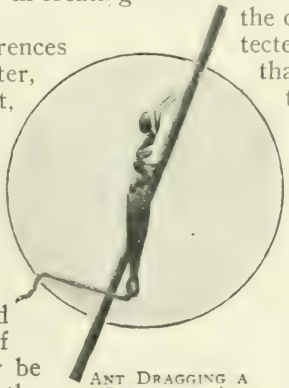
THROUGH THE EYES OF TINY INSECTS

By Paul Griswold Holmes

A SCIENTIST recently took a strange photograph, using the compound eye of an insect as his lens. When the plate was developed there appeared one hundred and fifty separate and distinct photographs of the same object—one for each of the hundred and fifty eyes which make up the complex seeing organ of the tiny bug. Some insects have a thousand such eyes gathered together into one. Imagine what it must mean to look at a single enemy and see it multiplied into a company or a regiment!

Among scientists there is much debate as to just how much or how well insects, as a class, are able to see. It is fairly certain that certain wasps are quite dependent on their sense of sight in finding their way to their nests. They have been observed to carefully study the sticks, stones and leaves of grass which are close to the entrance to their nest and, on returning from a flight, to hunt up and identify these land marks before entering. If the surroundings are disturbed they sometimes have difficulty in locating their home.

It is also certain that occurrences of the most trivial character, from the human standpoint, are to myriads of insects catastrophes of world-shaking horror. A farm wagon drives up the lane from the stable. Its wheels throw out bits of clay and small stones which fall in overwhelming masses on the bodies and houses of vast communities of ants. A whole ant city may be wiped out in an instant, the laborious work of weeks instantly destroyed, by an ordinary incident of this sort.



ANT DRAGGING A GRASSHOPPER'S LEG UP A REED.

A woman, working with her trowel in the garden, empties a handful of earth into the path where an ant colony has set up its home. The little pile, two or three inches in height, must have appeared like the Rocky Mountains to the ants. But, as it lay between their home and a rotting pear, the sweetness of which they were taking back to the ant city, they built a straight road up and over the mountain and went on back to their labor.

Insects belonging to the higher orders often take advantage of little things about their nests, things which from a human standpoint would be of no importance whatever. A clear case of this nature was recently found by the writer upon the rocky face of a cliff where several large colonies of small red ants had chosen small natural holes in the otherwise solid rock as entrances to their houses. Indeed they may have used these holes for their entire nests without going to the usual trouble of excavating long tunnels in the earth. Being of solid stone, the communities were entirely protected from many natural enemies that are ever present and ready to destroy their usual abodes in the ground. These ants were indeed insect cliff dwellers, living in tiny natural caves high above the common road of insect travel. Not only were they making use of the caves, but also of tiny cracks in the rock. These served as smooth level roadways for the burdened and even the free insects of the colonies and no doubt

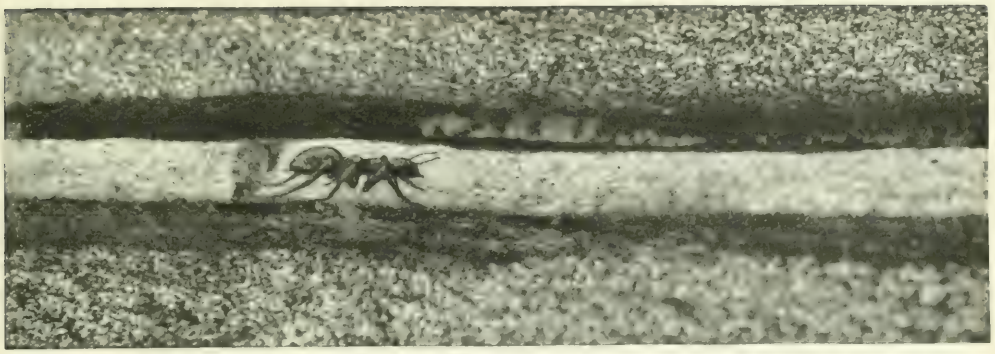
saved many an hour which might have been spent in trying to scale the perpendicular side of the cliff. These roads were also shorter routes to the nest by many an insect mile and in the course of a season would make quite a difference in the amount accomplished by a colony of "cliff dwellers."

Ants are curious little creatures and one always sees something new in their habits, if willing to study them patiently. They seem to have regular times set aside for recreation during which time I have watched them going through the motions of an apparently frightful battle. Again I have seen one insect flat upon its back while another combed and brushed it with the tiny combs which actually exist upon the fore legs of the insect. This recreation hour is usually held about noon on clear sunny days. Often the same spot will be used day after day for these games, and one will occasionally see several ants lying in the sun fast asleep while their brothers are sporting and undoubtedly "shouting" their merriment close by.

I once found one of these play grounds of the ants which consisted of a sun-warmed stone close to a small brook, the flat area of the top being the popular resort.

But recreation plays a very small part in the life of an ant. It is nature to them to work and their work is often of an extremely difficult sort. Their strength is, comparatively, far greater than that of a man, which will be seen from the fact that a single ant is equal to the task of carrying an object several times its own weight and twice its own size, either on the level or up almost perpendicular surfaces. Even more astounding, they accomplish these feats by holding the burden in their jaws! The insect in the illustration is a common mound ant, who rather than go around the base of a grass stem, went first to the top and then down the other side of the stem with its burden which consisted of the leg of a grasshop-

WHAT MUST THIS HUGE ROUNDED BODY BE TO THE TINY SPIDER?

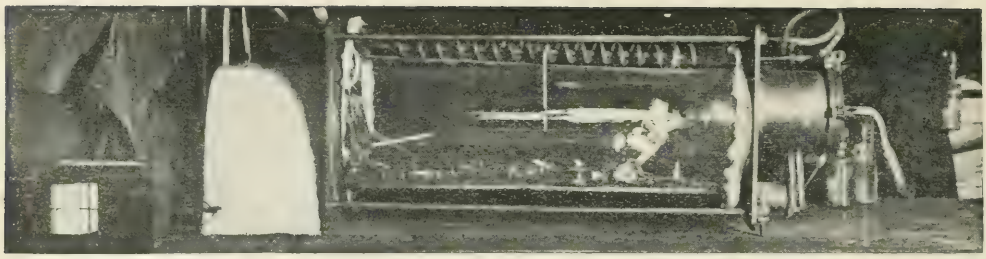


THIS NARROW RUT TO THE ANT IS A BROAD HIGHWAY.

per! For the reason, you must consult the ant, who went about the task in the most serious manner imaginable.

Let us now suppose that some insects are capable of seeing objects quite clearly when the object is at close range. This is probably the case with such creatures as crickets who are quick to recognize the slightest motion even when at some distance away. If it is true then that they possess clear vision, think what the world must be through the eyes of an insect! The grass is a mighty forest of curious thin stemmed plants set so close together that even walking is difficult. This jungle swarms with countless millions of creatures, many of them preying upon one another as in a real big jungle of the tropics. Huge serpents glide in and out, feasting upon the insect life, and field mice, gigantic rodents, dig great holes down into the forests roots where the insects live.

Men look back over hundreds of years and shudder for those poor mortals who lived in terror when the great prehistoric beasts inhabited our land. As prehistoric monsters were to men, so is man to the creatures of the insect world. He is a frightful creation, a thousand times the bulk of a mastodon. When he comes he casts a shadow over half a mile of insect land, his two great feet are like grinning monsters whose mouths never open, but always crush and crunch the insects in their paths. He crushes great sections of forest to earth with every step, when rain comes his foot prints fill and form great lakes, everywhere there is destruction in his wake!



HOW YOUNG CHICKS ARE KEPT FREE FROM MICROBES.

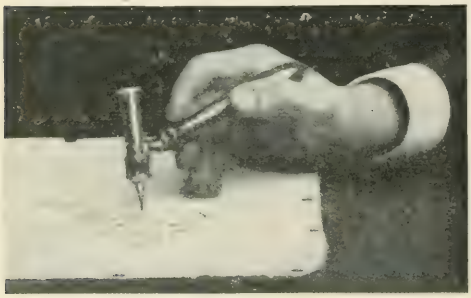
CHICKENS WITHOUT MICROBES

M. MICHAEL COHENDY, of the Pasteur Institute of Paris, employs an apparatus for raising chickens free of microbes.

As microbes have always been found to accompany life, many scientists have claimed that they were even a necessary condition for the existence of animate beings, human or animal, although recent researches have showed that some insects could live even if free of germs.

Suitable apparatus for raising the chickens, starting with the egg, and allowing them to grow under proper conditions for several weeks, was designed by M. Cohendy. This was necessary, as it would otherwise have become quite easy to be contaminated by the microbes that are always floating in the air, or that are contained in the different substances needed within the apparatus.

By working in a special antiseptic room, which has the walls and floor well sterilized, additional safeguards were secured to the operator. The invention serves, in the first place, as an incubator for hatching the eggs and then as a chamber where the chickens may live as long as may be desired. The main glass cylinder, with an inside sheet metal floor, serves for the live chickens, and opening into it on the left hand side is a smaller metal chamber used as the incubator. There is provided a felt curtain which hangs over the opening between these two chambers. The incubator end permits of the putting in of the eggs, and there is a second door in the metal chamber, at the other end of the cylinder, for taking out the live chickens, or for putting in grain, sand, and all that is needed here. The incubator is kept at the normal heat for hatching eggs by the use of a small gas burner placed underneath.



DYEING BY AID OF ELECTRICITY.

DYEING BY AID OF ELECTRICITY

IN order to create artistic designs by different colors on silk and velvet, a very old process was introduced from Java a few years ago. By means of an apparatus which permits liquid wax to flow out, the material to be dyed is covered with the wax so that the part which is to retain its original color cannot be touched by the dye. The most artistic designs may be produced in this way. This process may be repeated several times until the colors desired have been secured. After all the desired colors have been applied, the wax is washed out with benzine. The same method can be used in connection with wood, leather or metal, which may be dyed, etched or stained.

A drawback to this method has been that it was practically impossible to keep the wax at an even temperature so that it would flow out regularly. Electricity has remedied this difficulty, and apparatus has been produced which keeps the wax at an even temperature.

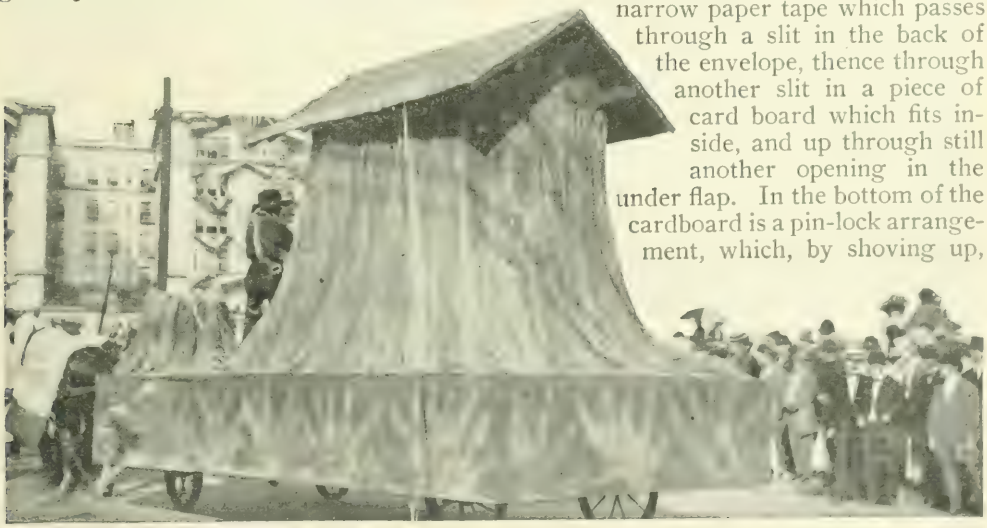
TREE STUMPS FOR HOUSES

THE westerner, after marketing a big tree, often finds the stump valuable for many purposes, although stumps as a rule reach the highest value when out of the ground, especially if they rest on fertile soil. For some reason the trunks of giant trees are ofttimes hollow for several feet above the ground, and those that are not, quickly rot out after the upper part of the tree is felled. Many of these stumps are so large that in some instances they afford sufficient room for living purposes until the owner is able to build a more commodious dwelling. All that is required is a roof, and a few bundles of shingles suffice for this purpose. And almost anyone who lives in the big-tree region of the West, is capable of the fairly simple process of properly nailing a few shingles upon a roof. The novel structures are used in various ways.

STUMP HOUSE IN USE NEAR SEATTLE, WASHINGTON.

Many lawns in the West have stump houses as ornaments and for children to play in. In logging camps the stump houses are useful as storehouses for giant powder, tools, and clearing gear.

Some of the Western cities are so proud of their stump houses that they invariably show them on floats in civic and festival parades. These stump houses are always greeted with interest and admiration.



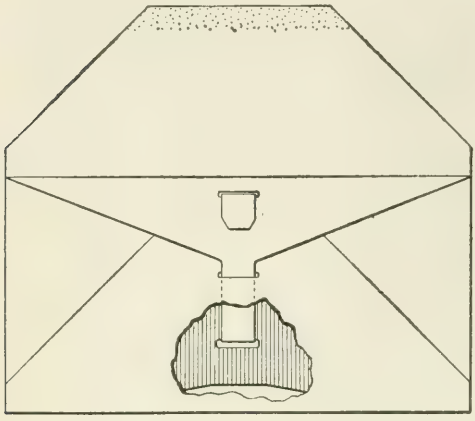
A STUMP HOUSE "ON PARADE."

SAFETY ENVELOPE

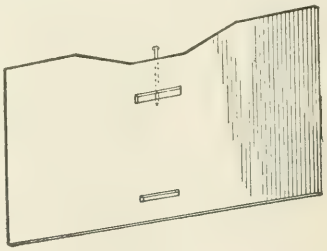
The postal department of the government, as well as many large commercial concerns, have long been on the lookout for an envelope that cannot be opened without the fact being detected. Such an envelope would be of inestimable value in transporting registered mail, and for many commercial purposes. Also, it should have value to individuals in certain instances, although, as a rule, an envelope of this kind is not, of course, needed by the general public.

A soldier named C. N. England has invented an envelope of this class which seems to meet all the requirements for which designed. The envelope may be made in any shape or size, and when sealed resembles the ordinary envelope. There are two flaps on the inventor's envelope, the first one having a long, narrow paper tape which passes through a slit in the back of the envelope, thence through another slit in a piece of card board which fits inside, and up through still another opening in the under flap. In the bottom of the cardboard is a pin-lock arrangement, which, by shoving up,

locks the tape. The top flap is mucilaged for sealing in the ordinary way, giving the container the appearance of a common envelope. While the envelope and cardboard weigh less than an ounce, the cardboard is stiff enough to give the contents of the envelope protection from rough handling. Registered packages may be placed in this container and "locked" securely in the bundles and sealed by the postal department.



SHOWING HOW THE ENVELOPE IS "LOCKED."



DETAIL OF THE "LOCK."

FARTHEST NORTH AMERICANS

THE Farthest North American Indians are the Eskimos of northwestern Greenland. In fact they are the most northern inhabitants of the world and it is these people and dogs and sleds upon whom the many seekers of the North Pole depended for assistance in transportation. Their clothing is made from the skin of seals, reindeer and dogs, their houses are often built of snow and their various activities relate always solely to the mere struggle for existence.

A notable group of figures representing a family of these remarkable people has been placed on exhibition in the great National Museum at Washington. It shows a family moving in the springtime across the icy fields. The young man has succeeded in clubbing a small seal, and having summoned the sledge party to haul it home is laughed at by the older man who tells him that he should have carried it on his back. This scene has been chosen with the view of illustrating the noteworthy fact that these Farthest North people are exceptionally cheerful in disposition, notwithstanding the rigors of the climate and the hardships of their lives. The woman who carries a babe in her hood is about to help attach the seal to the sledge, and the girl and the little boy are all interested in the episode.

Another group portrays a collection of dwellings in process of construction, these being Eskimos who live somewhat farther to the south. Their winter houses are built of large blocks of compact snow, laid up in a spiral manner, forming a dome. The main chamber of the house varies from five to twelve feet in height and from seven to fifteen feet in diameter. Over the entrance a square is cut and covered with the intestine of the seal to serve as a window. The main domed chamber is connected by passage-

MODEL REPRESENTING AMERICAN ESKIMOS WHO LIVE FARTHEST NORTH.

ways with one or more subordinate chambers which serve as store rooms. To these Eskimos, unlike their more northern neighbors, summer brings open water and they fish from their skin kayaks or canoes, but in winter seal are captured by cutting holes in the ice.

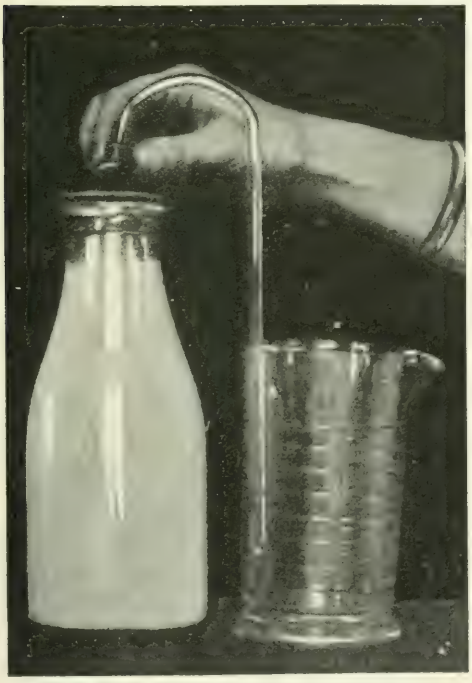
SIPHON FOR EMPTYING MILK BOTTLES

SCIENTIFIC research has proved that milk in bottles, which has been delivered to the consumer in a comparatively healthy state—that is, containing only a few germs—will show that these same germs several hours after the delivery to the customer have multiplied a thousandfold. This is often due to careless handling after the bottle has been opened. The illustrations show a new apparatus which is very simple and which has been brought into the market by an English inventor. In order to assure cleanliness, a rubber cover with a bent glass tube attached closes the bottle. A slight pressure with the fingers on the upper part of the cover is sufficient to drive out the milk by air pressure. By this simple means the milk is hermetically protected and no dust or dirt can come in contact with it. All the care that is necessary is the cleaning of the glass tube.

The device is obviously so simple and so easy to operate that its success should be assured.

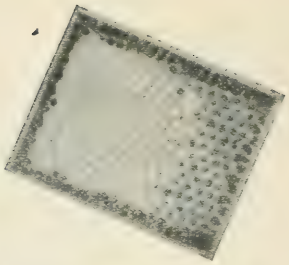
CHALET IN A DEPOT.

The Swiss Chalet on the little cliff, with its beautiful parks and suspension bridge, is a pleasing view that meets the eyes of the traveler in Rockford, Illinois. The railroad company has done its share in carrying out the ideas of the owner of the chalet, by beautifying its own side of the little stream, which flows past the depot, and has spent considerable sums in flower gardens, lagoons and walks.



THE SIPHON IN POSITION.

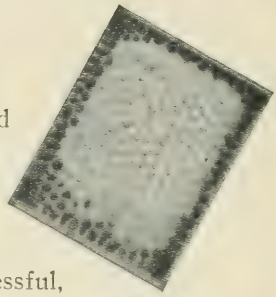
THE SIPHON AT WORK.



BIG PROFITS FROM FEW BEES

By

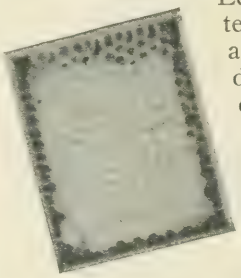
D. H. SNELL



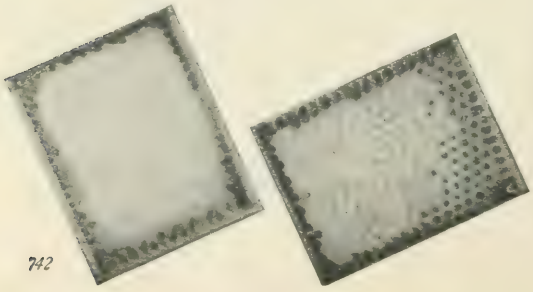
TWENTY-SEVEN dollars' worth of honey from one hive! Did anybody's bees beat that this season? If they did, William R. Lewis, custodian of the grounds and buildings at the Kansas Agricultural College, would like to hear of it. Mr. Lewis believes he—or his bees, rather—have made a record. He has read bee papers and magazines for years but he doesn't remember of any honey yields that compare with this one of his—180 pounds in one season. Of course California bees exceed that sometimes but then they have blossoms all the year round on which to work.

Ten swarms are in the Lewis apiary on the campus of the agricultural college. They all did exceptionally well this year. The average was 100 pounds of honey apiece, or 1,000 pounds in all. At fifteen cents a pound, the price Mr. Lewis received, the receipts from this apiary were $150. Deduct $10 from that for expenses and you have Mr. Lewis's profit for this summer—$140. All for only a few minutes' work every day. Mr. Lewis says it was easy money. He also says he could have sold ten times as much as he had.

Lewis knows the bee business from the "feelers" to the stinger. And that, as you know, covers both ends of it. He has raised bees for twenty-five or thirty years, he isn't certain just which. He has been pretty successful, too. But he says there's no mystery about bee-raising, once you understand it. Any farmer, says Mr. Lewis, could tend to ten or twenty hives and make a few hundred extra dollars every year, and have enough honey to supply his table, too. To get a start would cost only about $5 a swarm and $3 a hive for the supers—frames in which the honey is made. The cost of an apiary might be taken from the first year's receipts and still leave a profit.



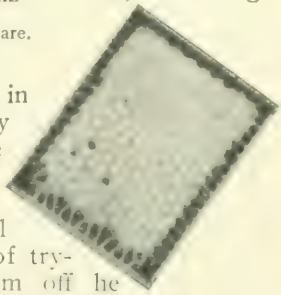
There are very few things to do around an apiary but these few things must be done at the right time. And therein lies the hidden "secret of success" with bees, Lewis says. You must put on a new super just at the proper time or there will be trouble. You must know when a new brood is about to swarm so you can be ready with a new hive before the bees get away from you. You must be able to detect bee diseases, too, and know how to combat them. If you are careful in this, little trouble will be had with disease. Above all, don't get it into your head that bee-raising is mainly knowing how to dodge the stingers. That's the least of the requirements. You

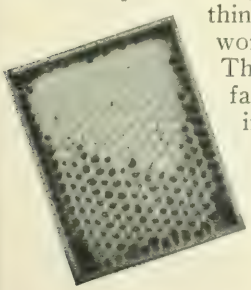


don't want to think that there's danger of being stung when you are working with a hive. If you do, the chances are you'll be stung. If you work carefully and steadily, and don't get excited, and don't drop anything on the bees or oppress them they will treat you with the utmost courtesy. But busy bees have no time for trifling; they are in dead earnest all the time and it is their wish that you transact your business with them in a businesslike way. Furthermore, they demand respect. And if you are a wise apiarist, says Mr. Lewis, you'll give it to them.

GATHERING SOME OF THE 1,000 POUNDS OF HONEY IN THE LEWIS APIARY.
Mr. Lewis uses a net over his face only, leaving his hands bare.

More farmers would keep bees if they weren't afraid of them. They would never admit it, but that's the real reason. Instead of looking on it as the most interesting kind of work, as all experienced apiarists do, the average farmer thinks it's disagreeable work to care for them. The same thing keeps farmers from engaging in the dairy business. Milking is disagreeable; they dislike it. Confidence and carefulness in handling bees will prevent their harming anyone, Mr. Lewis says. He uses a net over his face when working over a hive, but other than that he is unprotected. His hands are bare. Once a large brood swarmed on his bare arm. He was working near the hive that day preparing another hive for the new brood to occupy. As the brood began to emerge from the old hive he saw the queen jumping about helpless with a broken wing. He picked up the injured leader, intending to deposit her in front of the empty hive, but before he could carry her to it his arm was covered with loyal subjects. Instead of trying to brush them off he stood still and the entire brood hung to his arm from his shoulder to the tips of his fingers. So confident was he that they would not harm him that he walked a short distance to his house, walked into it and showed the swarm to a much horrified family, then out again and to the empty hive where the brood was shaken off quietly and induced to enter the new home. All accomplished without so much as a single sting.





No Forgetting It for Him

MRS. MOWCHER (to hubby)—"Dearest, do you know that this is the anniversary of our wedding day?"

MR. M.—"There you go, throwing that in my face—and I had planned to enjoy myself."

None Too Soon

PERTURBED DINER—"What on earth is the matter with you this evening, waiter? First you give me the fish, and now you give me the soup."

WAITER (confidentially)—"Well, to tell the truth, sir, it was 'igh time you 'ad that fish."

—The Sketch.

First Come, First Served

The lovely girl, having lingered a minute in her room to adjust her transformation, change the angle of her Grecian band, and make sure that her skirt fitted like the peeling of a plum, descended to the parlor to find the family pet ensconced upon the knee of the young man caller, her curly head nestled comfortably against his shoulder.

"Why, Mabel," the young lady exclaimed, "aren't you ashamed of yourself! Get right down."

"Sha'n't do it," retorted the child. *"I got here first."—Everybody's.*

Immune

FARMER GRAYNECK—S'pose you are goin' to git the automobile fever, Ezry, like everybody else?

FARMER HORNBEAK—Nope! I've been vaccinated in the pocketbook, and it took.—*Puck.*

What He Gained

"MRS. HAYES tells me that you tied a tin can to her dog's tail," said the mother to her son. "What a shameful thing to do!" "Yes, ma'am." "Do you know that the poor dog ran away so far that he has never come back—that he probably ran himself to death?" "Yes, ma'am." "Oh, Robert! What do you gain by such cruelty?" "I gained a dollar from Mr. Hayes."

—New Orleans Picayune.

Patient

MRS.—"Just think, Henry, we've never had a cross word."

HE—"No, Mame. Aint I the patient cuss?"

—New York Globe.

Exciting Gaiety

Mrs. Blanc was giving a tea party on her yacht. The affair for some reason was dragging dreadfully. The guests talked of nothing but the weather, and even in this talk there would come long, deathly silences. Suddenly Mrs. Blanc, losing her balance, fell heavily against her mother-in-law, who sat beside the low rail, and with a moaning cry the dear old lady went headforemost overboard. Of course she was rescued; but afterward Mr. Blanc took Mrs. Blanc privately to task. "How clumsy you are," he said, "to knock mother into the water like that. I'm afraid she won't care to visit us again in a hurry. You really should be more careful." "Now, George," said Mrs. Blanc, "be reasonable. I had to do something. I simply had to. Didn't you see how our party was dragging?"

Wasted Talent

FRIEND—"You are wasting your time painting pictures, old chap."

ARTIST—"But I sell my pictures."

FRIEND—"That proves what I said. It shows that you could sell anything, so why not take up something there's big money in?"—*Boston Transcript.*

A Hard One

REPRESENTATIVE DUDLEY M. HUGHES, of Georgia, is called a farmer statesman and devotes much of his time to the agricultural interests of his district. He has requests for many new kinds of seeds, and a time ago received this letter:

DEAR DUD—Sam Yopp's been tellin' me of a new seedless tomatter the Guvment is growin'. I'm writing to you in hopes you will send me some of the seeds.—*Saturday Evening Post.*

Discovered

LECTURER—"All statistics prove that the blonde woman is more difficult to get along with than the brunette."

ASTONISHED MAN IN THE AUDIENCE (starting up)—"Are you certain of the fact?"

Lecturer—"It is a fact."

Astonished Man—"Then I believe my wife's black hair is dyed."—*The Pathfinder.*

Wise Man

DURING the cotton-picking season in Texas a colored brother who had gone into the country to work returned very much disgusted. "Didn't yo' git no offahs ter pick no cotton?" asked a friend. "Sech ez dey was. White man done offered me one-third o' wat Ah could pick. Ah done tuk a look at de field an' saw dat when it wah all picked it wouldn't amount ter one-third. So Ah done lit out fer home!"

Those Lovely Associations

MRS. FUSSY (on her first visit to Niagara Falls)—"Oh, Harry. That reminds me I forgot to turn off the water in the kitchen sink."

—*Puck.*

Way to Handle Them

THE divorce court was grinding.

"All ladies who married on a bet or a dare or for a joke will stand up," announced the clerk.

They lined up.

"Your applications are denied. Now the regular cases will be heard."—*Washington Herald.*

Proved Honesty

To illustrate a certain type of honesty, former District Attorney Jerome, at a dinner in New York, told the following story:

"There was a man," he said, "who applied for a position in a dry-goods house. His appearance wasn't prepossessing, and references were demanded. After some hesitation, he gave the name of a driver in the firm's employ. The driver, he thought, would vouch for him.

"A clerk sought out the driver, and asked him if the applicant was honest.

"'Honest?' the driver said. 'Why, his honesty's been proved again and again. To my certain knowledge he's been arrested nine times for stealing, and every time he was acquitted."

Or Something

"How is your wife this morning, Uncle Henry?"

"Well, I donno, she's failing dretful slow. I do wish she'd get well—or something."

GRAIN FROM CHINA TO FEED US

By

RENÉ BACHE

DURING the progress of the Russo-Japanese war, in Manchuria, the news dispatches made frequent mention of the maneuvering of infantry, and even of cavalry, under cover of the shelter afforded by fields of "tall millet."

The plant concerned, however, was not a species of millet, but what is known in China as the "kaoliang." There are quite a number of varieties, some of which attain a height exceeding twenty feet.

What makes the matter interesting just now is that the seeds of several of the most valuable "kaoliangs" have recently been brought to this country, and experiments are being made with them by the Department of Agriculture with a view to their introduction in some parts of the United States as a grain-producing crop. Requiring a minimum of water and producing a bounteous store of edible seeds, borne in huge "heads," they are expected to be most useful as a source of human food. The seeds, which somewhat resemble maize in composition, make excellent bread and griddle-cakes.

The plant is valuable, however, in many other ways—so many indeed, that it is difficult to see how Manchuria, agriculturally speaking, could get along without it. The stalks are almost as useful as the grain itself. Over wide areas they are the chief supply of fuel, being employed to cook the food, to boil water for tea, and to heat the brick bedsteads in cold weather. In winter, an icy wind blows over the plains of North China and to protect themselves against this enemy to comfort, the people build fences of "kaoliang" stems around their houses, stables and pigpens.

The stalks are also used for making baskets and mats, certain highly-colored varieties of the plant being grown for this special purpose. In the manufacture of fancy baskets, the outer skin only is employed, being split off in strips. But a more important mode of utilizing the stalks is in the building of houses. When the poor Chinaman builds himself a home, he first erects a frame of poplar and willow poles. Between these he places "kaoliang" stalks, and then smears the whole frame over with mud, in which chopped-up straw or hair has been mixed to give it consistency. When this is dry the house is ready for occupancy.

The roof-frames of the primitive Chinese greenhouses are made of "kaoliang" stems. Also the latter are used as frames for kites and in the manufacture of toys for children. Dried for fuel, they are worth five dollars per ton, being sold in bundles; even the roots are grubbed up and utilized as fuel. And over most of North China draft animals depend mainly for food upon the chopped stalks, mixed with a few handfuls of beans and boiled.

Eight pounds of the seed will sow an acre of ground and the yield in grain should be half a ton. The seeds are white, light brown or dark brown according to variety. When once the young plants have started, helped by the rains of early summer, they shoot up with amazing quickness and can almost be seen to grow. In late September the stalks are cut off near the roots and the "heads," separated from them, are spread out in the sun to dry, on matting. After a few days they are transferred to a clay thrashing floor, and stone rollers, hitched to mules, donkeys, old men, women or boys, are dragged over them. In this primitive way the grain is threshed out and after being winnowed by tossing it into the air, it is stored in sacks, in earthen jars or in baskets smeared over with clay.

Dr. Frank N. Meyer, the government agriculture explorer, who sent the seeds

of the "kaoliangs" from Manchuria, writes: "Of the many crops the Chinese grow in North China this is the most important and most useful. Without it life in a great part of North China and Manchuria would be almost impossible, for the variety of uses to which the 'kaoliang' is put are legion, and it could not very well be replaced by any other single crop. The light-colored varieties are ground into flour, out of which cakes are made, or are simply boiled in water and served in the form of a gruel. The dark-colored seeds are coarser, and are employed for distilling purposes and as fodder for horses and cattle. As a feed for horses and mules they take the same place that oats do with us."

In North China a very fiery kind of whiskey, often called "Chinese wine," is distilled from the seeds of the "kaoliang," and is carted about the country in amazing quantities (says Dr. Meyer) for sale. It goes by the name of "samshu." The grain is grown also in Japan on a large scale and is widely employed for making a kind of pudding called "mochi."

The Department of Agriculture, in a bulletin on the subject soon to be issued, says: "The 'kaoliangs' are of almost no value as forage, the stems being dry and the leaves few and small. They are not likely to displace the grain sorghums, such as the 'milos,' 'durras,' and 'kafirs,' now grown in this country. At the same time, on account of their earliness, and perhaps greater hardiness also, they have apparently a distinct place of their own to fill in the more northern and more elevated parts of the dry-farmed areas."

DR. FRANK N. MEYER AND THE DWARF VARIETY OF KAOLIANG—LOWER PHOTO—THAT HE BROUGHT FROM CHINA.
The Department of Agriculture expects to add this to our cereals.

THE NEW KIND OF GRAIN NOW BEING GROWN IN TEXAS.
The seed heads are huge; the plants grow to a height of four and a half feet.

Preliminary experiments with the "kaoliangs" are being made on the Amarillo experiment farm, which is the chief breeding station of the office of grain investigations for grain sorghums. This farm is located about two miles from the town of Amarillo, in the Panhandle of Texas. The elevation is 3,600 feet, the average annual rainfall only about twenty-one inches, and the summer temperatures high, with little moisure in the air — conditions severe enough to "weed out" and exclude from further consideration the least desirable varieties.

Incidentally, an important object of the experiments is to obtain by selection from among the individual plants, better varieties than any of those actually fetched from China— the qualities chiefly demanded being earliness, dwarf to medium stature and compact, well-filled heads.

Dr. Meyer, in his extensive travels through Manchuria, Central Asia and other parts of the Far East, has come upon many varieties of grains and fruits, some of which, it has already been proved, can be successfully grown in this country.

These agricultural importations will add millions to the nation's wealth.

Philosophy of Epictetus

What is the first business of one who studies philosophy? To part with self-conceit. For it is impossible for any one to begin to learn what he thinks that he already knows.

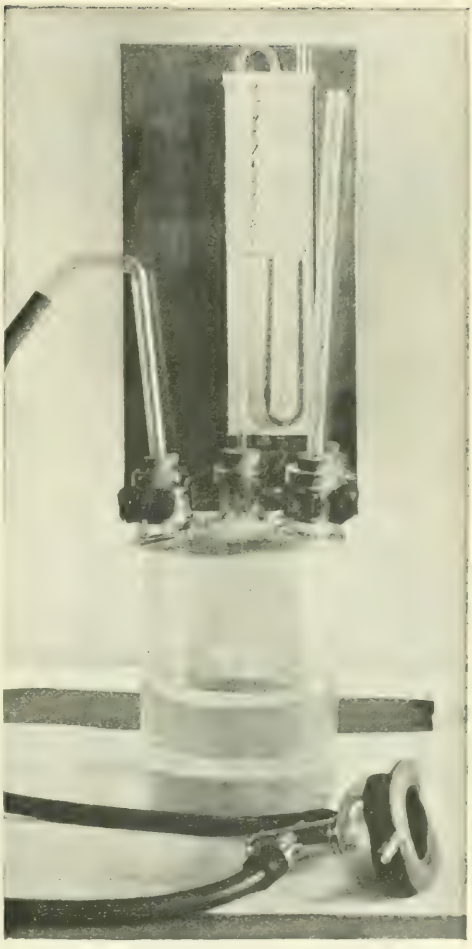
Shall I show you the muscular training of a philosopher? "What muscles are those?"—A will undisappointed; evils avoided; powers daily exercised; careful resolutions; unerring decisions.

BREATHING BY MACHINERY

IF you cannot go to the mountain, a new device makes it possible for you to bring the mountain-air effects to your home. For be it remembered that it is not the quality of air at three thousand feet, say, that benefits people with lung troubles, but the quantity, the rareness of the atmosphere requiring strenuous effort on the part of the lungs to keep the system supplied, and the exercise involved strengthening them just as boxing makes for big biceps. The device in question consists essentially of two parts: a closed reservoir through which the individual breathes, inhaling against the weight of four to six inches of water; and a vacuum or suction equivalent to twenty to twenty-five inches of mercury, into which the individual exhales.

A suction mask for fitting over the nose and mouth connects by rubber tubes with the vacuum and the water. Until one has attempted to derive his air supply from this apparatus, he is unable to appreciate how simple an affair is the natural manner of air getting. In the first place, it is extremely easy to fill the lungs with air when no obstacle intervenes, but when one must pull against six inches of water, the breathing is truly labored. Exhaling by machinery is no less complicated, though a great deal easier, for one breathes into a half-inch tube having a vacuum pull equal to twenty to twenty-five inches of mercury, which insures rapid and complete emptying of the lungs.

For people with small lung capacity, equally with cases having weak lungs, the device is invaluable, for its continued use in doses of fifteen to twenty minutes twice a day increases to a remarkable degree the capacity of these organs. It is also of great value for persons whose work keeps them bent over a desk all day, serving to correct the evil effects upon the lungs of sedentary labor.



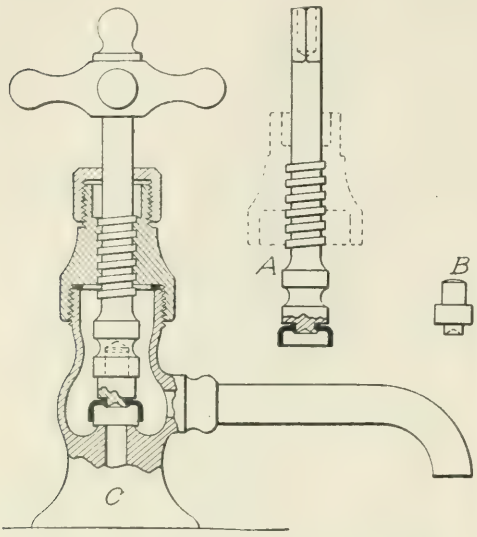
IN CASE YOU CANNOT GO TO THE MOUNTAIN, THIS MACHINE BRINGS THE MOUNTAIN TO YOU.

WASH-BOWL FAUCET

WHEN the threads of your wash-bowl faucet become so worn that it is impossible to turn the water off because the valve-stem slips back upon the worn threads, the only remedy would seem to be a new faucet, or two of them if it is impossible to get a new one to match the remaining good one.

This expense may be avoided by lengthening the stem as shown in the sketches. *A* shows the stem in its original form. *B* shows a piece which should be turned up out of three-eighths or one-half inch brass rod, the central portion being of sufficient length to raise the stem so that it engages with unworn threads, but not to raise it so high that no further upward travel is possible. This piece is to be driven tightly into a hole drilled into the end of the stem, after removing the little cup which holds the rubber washer. The cup is then to be slipped on and the projecting end

portion spun over to hold it on, just as it was originally held on the end of the valve-stem. *C* shows the parts as finally assembled. It will be seen that the stem



Wash-Bowl Faucet.

is raised so that unworn threads are thrown into engagement even when the faucet is turned off hard. The lower end of piece *B* should be countersunk slightly, as shown, to facilitate the spinning or riveting on of the cup.

One of Six Largest Single-Block Statues.

SINGLE-BLOCK STATUES

SIX immense statues over the entrance to Union Station, Washington, D. C., put the finishing touch to one of the handsomest railroad terminals in the country.

These statues are the largest ever hewn from single blocks of granite and form the last work of the late Augustus St. Gaudens. Each statue weighs over twenty-five tons, and required the efforts of twenty-two horses to haul it to the station and a specially constructed donkey engine to hoist it into place. The size may be appreciated by comparing it with the men standing beside it.

A Sponge Rock.

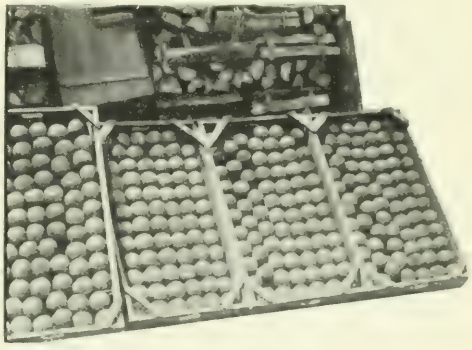
ROCKS LIKE SPONGES

THE Sponge rocks near Livingston, Montana, have attracted the attention of many travelers and scientists on account of the remarkable tracery and porosity of their formation. They appear like vast pieces of pumice stone intricately carved by nature into innumerable cells, webs, and cavelets. Some of the pieces are almost threadlike. The rock is stated by geologists to be a carboniferous sandstone. The spongelike formation is of course due to both water and wind erosion, the softer particles of the rock having been washed or blown away, leaving the harder portions standing. The faces of the rocks which are swept by the prevailing winds present the most intense marking, showing that the wind-swept sand has done its part in sculpturing the rocks into their present beautiful and fantastic forms.

RED CLOVER IN THE WEST

THE hay crop of the West is alfalfa. Vast fields stretch away before the eye sometimes several thousand acres in extent, from which from three to five cuttings are obtained. The traveler from the Eastern States sees the clover-like plant with its small purple blossom but usually looks in vain for the familiar red clover blossom. Alfalfa, which was imported into the United States from Europe by the Spaniards, took so readily to the Western soil and climate, under irrigation, that its use gradually spread over the entire West and it became practically the only tame forage plant. Recently, however, other plants, among them red clover, have been tried in some sections and several irrigated valleys in Montana, Idaho, and other States are growing clover with great success, a far greater success in fact than is ever attained in the East. Under irrigation red clover makes a wonderful growth, the clover heads reaching twice the size they do in Eastern hay fields. Alfalfa makes a splendid hay and is eaten readily by all stock; yet they will leave it and turn eagerly to red clover hay. The photograph shows a second cutting of red clover on some of the desert land reclaimed by Uncle Sam in Idaho, the ranch of Henry Hite, one of the prosperous settlers on the Minidoka government irrigation project. The great hayrick in the background is the result of the first cutting. Four years ago this land was primeval desert, covered with sagebrush and supporting only a few colonies of prairie dogs and rattlesnakes. Now it grows crops the size of which would make the mouth of an Eastern farmer water with envy.

But, then, that is true of so many other crops produced in the West, the land of plenty.



CHARCOAL BALLS AS SOLD IN JAPAN.
The charcoal is ground up, mixed with water, and the paste is then pressed into balls to be used as fuel.

LONG-TAILED JAPANESE FOWLS

THE tail feathers of this curious Japanese bird measure no less than twelve feet. This startling and curious specimen of the animal world has so interested scientists that at one of the Carnegie experimental stations the remarkable phenomenon of the tail growth is now being worked out with the ultimate possibility of the breed's being raised in America. The introduction of the breed is said to have been brought about by a prince of Japan, whose imperial crest was a feather. Yearly he offered a prize to the subject who would bring to him the longest feather. The greatest effort and skill were therefore employed by the breeders to produce the greatest length of tail feathers possible.

At present only a few old fanciers are said to know the process of successfully

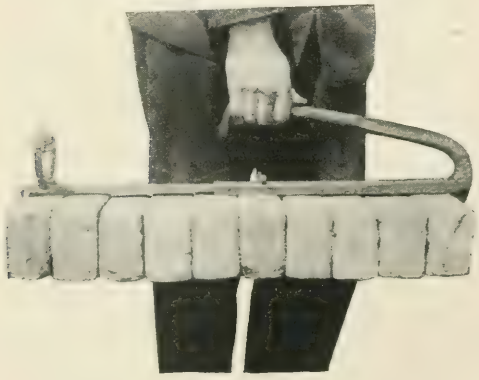
breeding these fowls. A few authentic details have, however, been obtained in regard to the method of their breeding. The particular breed is confined to the region in and among Kochi, the capital of a province of Tasso. The breed is about a hundred years old and is fast dying out. There is said to be no artificial method of making the feathers grow. All is done by selection. Moreover, one must know how to treat the birds during the various stages of tail growth. The body feathers springing from the shoulders attain a length of four feet. Two years is the time necessary to produce a full growth of tail. The tail feathers grow from four to seven inches a month, and continue to increase as the bird lives, which is usually from eight to ten years. The hens lay about thirty eggs in the spring and autumn, which are hatched by other fowl. Thus the hen shirks the irksome part of the process.

The hens are kept housed up and sit all day on a flat perch, and are taken out only once in two days and allowed to walk half an hour or so, a man holding up the tails to prevent them from being torn or soiled.

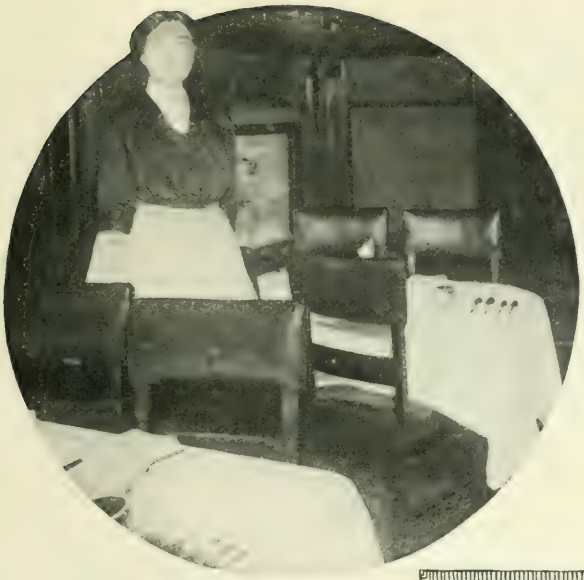
Long-Tailed Japanese Fowl.

DEPARTURE IN HANDLING BRICKS

THIS picker for the rapid handling of bricks was designed and patented by a resident of Hamilton, Canada. As shown in the picture, there are ten bricks in the device but it has a range of from six to fifteen. It is easily adjusted by means of the thumbscrew near the center. The use of only one hand is required. The contrivance is employed extensively for the unloading of cars filled with bricks, tile, or other material of similar size and shape. It has been shown by actual test that one man with this picker can do six men's work. Only five parts go with the apparatus and should any one of the parts break, it may be very easily replaced.



New Device for Handling Bricks.



First Woman in Charge of a Dining Car.
Miss Carrie Benton of Cincinnati holds this position on a branch of the Baltimore and Ohio Railway.

CLOCK KEEPS WORLD-WIDE TIME

A BERLIN court watchmaker exhibits in his shop window a world clock that shows many remarkable features, comprising nine dials which indicate the time in nine countries. The dials marked with the names of Berlin, Paris, London, New York, San Francisco, and St. Petersburg, respectively, bear Arabic figures; the dial bearing the name of Constantinople is marked with Turkish (or rather true Arabic) figures; that of Pekin, Chinese; and that of Tokyo, Japanese signs.

The whole set of hands and the main clockwork, inclusive of the escapement, are actuated by a single motive spring, and the bearings and gearings had therefore to be manufactured with the most scrupulous care.

Clock Keeps World-Wide Time.

NEW SAFETY LAMP FOR MINES

THE Government of Great Britain recently awarded a first prize of $3,000 for the best safety lamp to a German company. The requirements for this lamp were the impossibility of ignition of any gas within or without the lamp, simple construction, cheap cost and maintenance, and light weight. There were two hundred competitors and eight aside from the big winner received prizes of $250 each.

A picture of the best lamp is shown; it is, of course, an electric lamp of very simple and compact construction. A large number of English mine owners have already followed the recom-

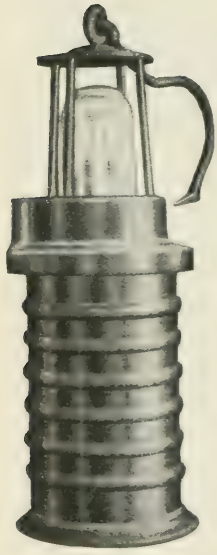
One of Germany's Oldest Women. Frau Heinrich, of Berlin, Aged 100 Years.
Her career was that of a washerwoman. She has always lived in the same house.

WINTER'S ARTISTIC SCULPTURE—HOW THE ICE FORMED AFTER A SNOWFALL NEAR BERLIN, GERMANY.

mendation of the government, securing a supply for their mines.

Mining is the great basic industry in England, and, therefore, it behooves the state to try, by every means possible, to so regulate working conditions as to insure the maximum of safety for the miners.

RAISING TURKEYS IN A TRUNK



NEW SAFETY LAMP FOR MINES.

A NOVEL poultry house is that on the ranch of F. G. Latter at Tropico, California, this house being simply an old worn-out trunk. It was transformed into a turkey house by simply cutting a door, about a foot square, through one end, the lid being hinged in its original manner.

The owner's troubles began when he started to raise turkeys. His ranch is peculiarly situated, being in a gully which is entirely covered with large eucalyptus trees, and from the first the results of his efforts in the turkey-raising line were very discouraging. He experimented for months and had almost decided to cut some of the trees down so that more sunlight could get into the gully, when he spied an old trunk lying at one side of the yard. A brilliant idea flashed through his mind. Suiting the action to the thought, he cut a hole for the door, through one end of the trunk, and, after placing the trunk in a sunny locality, put several small turks in their new-made home. They grew and thrived. He tried brood after brood in the little bungalow trunk and they all grew wonderfully. The success has been almost complete, only three or four birds having died during the past year. Anyone who has ever raised turkeys will realize what this means.

On windy days the owner closes the door and raises the lid so that the sun may shine down upon the little fellows. This eliminates all draught and the young birds do not catch cold as they would were they allowed to run out on the damp ground.

Though the "Golden State" is noted for its bungalows, this type is distinctly something new even in that land of original ideas.

TRUNK WHICH IS USED FOR RAISING TURKEYS

TWO HUNDRED THOUSAND DOLLAR DANCE HALL AT NEWARK, N. J.

AT LAST—THE "SAFE" DANCE HALL

By

HERMAN H. BRINSMADE

NEWARK, N. J., has a public dance hall, erected by the Social Centers Corporation, at an expenditure of $200,000. The purpose is to furnish a ball room, accessible to all with the evil features of the concert hall eliminated. No liquor of an intoxicating nature can ever be sold on the premises, and no person of known bad character can be admitted.

It was this very feature that the founders had in mind—the building of a place where, under wholesome surroundings and proper restraints, the respectable element of the city could mingle.

The building is of brick construction, one story in height. It has a ground dimension of 137 by 147 feet. Running round the dance floor is a wide promenade, above which is a balcony and smoking and refreshment rooms.

Dances are held every night from 8:30 until midnight. Dancing lessons are also given for two dollars a course.

A floor manager sees to it that order

is maintained. Men and women chaperones are also provided to assure proper conduct.

If the expectations of the founders are realized, the Palace ball room will be by no means a charitable institution. The admission fee of ten cents for men and boys and five cents for women and girls, will, it is expected, meet all the current expenses of the place and leave a fair return on the investment. The admission fee entitles the holder to one dance, of about six minutes' duration, and free cloak room.

To popularize the place, matinee and folk dances on Saturdays for children are to be made a feature, and on certain days the Newark public playground clubs are to hold forth.

The Palace ball room has to compete with about five hundred saloon dance halls, many of questionable character.

The ball room accommodates five hundred couples easily. Of course so large a number cannot be expected except on special occasions. The average attendance thus far has surpassed the most optimistic hopes—a hundred or more couples being on hand every night. If the experiment proves a thorough success, similar dance halls will be erected in New York, Brooklyn, Philadelphia, and other Eastern cities.

Proverbs

Few may play with the devil and win.

Among the blind the one-eyed is king.

Although it rain, throw not away the watering pot.

Creditors are a superstitious set, great observers of set days and times.

He is strong that can knock a man down; he is stronger who can lift himself up.

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Technical World Magazine
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